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YARWOOD (C. E.). **Increased yield and disease resistance of giant hill Potatoes.**—*Amer. Potato J.*, xxiii, 10, pp. 352–369, 1 fig., 1 graph, 1946.

Netted Gem potato crops in the San Juan district of San Benito County, California, have exhibited in the last few years a widespread decline disease characterized by the premature death (within 70 to 100 days from planting) of the aerial parts of the plants. The cause of the trouble has not yet been determined, but the condition is associated with heavy infection by *Verticillium albo-atrum* and *Corticium vagum* [*C. solani*]. In every case, however, a few large stools were present which survived the rest and lived up to 134 days from sowing; these plants were resistant to *V. albo-atrum*, and, on an average, yielded 63 per cent. greater gross weight of tubers than the plants dying earlier. The giant plants have longer, heavier, and more branched aerial parts, fewer stems per hill, and an increased number and length of stolons. Selections of such late-maturing plants closely resembled those which have been described as giant hills [*R.A.M.*, xiii, p. 722] (also called bolters or males in Europe) and commonly considered to be due to a virus disease. All the progenies of such selections reproduced the early maturing character of the original plants, but to a varying degree, and the various strains developed from them also appeared to differ greatly with respect to most if not all the characteristics observed. Tests conducted from 1942 to 1945 showed them to be less susceptible to *Phytophthora infestans*, *Alternaria solani*, and *C. solani* and to be frost-resistant.

BARIBEAU (B.). **Seed Potato districts and virus diseases in Quebec.**—*Sci. Agric.*, xxvi, 12, pp. 654–661, 1 map, 1946.

In the Province of Quebec seed potatoes are grown in five main districts. Trials were made on 40 farms in these districts to determine the areas best suited to growing Foundation and Foundation A grades of potatoes. In the tests virus-free tubers of the Green Mountain and Irish Cobbler varieties were grown according to the tuber-unit method [*R.A.M.*, xxiv, p. 466]. The crops, amounting to some 125 to 300 bush. annually, were indexed in the autumn, and tested for virus diseases during the winter, by the tuber-index method [ibid., xv, p. 43].

As a result it was found that, while the incidence of leaf roll and mosaic varied with the season, locality, and isolation, both diseases showed an increase in occurrence and transmission the farther the growing areas were located towards the south and south-west of the Province. In general, the cool hill regions with well-spaced potato fields produce better seed than the warmer, lower districts, where the fields are close together. The author recommends the growing of seed potatoes in the north and north-east, while in the south and south-west it should be abandoned in favour of table stock. Bacterial ring rot [*Corynebacterium sepedonicum*] was never found in tuber-unit seed plots, and it is suggested that this method may provide a means of controlling the disease.

Cook (H. T.). **A method of forecasting late-blight epiphytotics in eastern Virginia.**—Abs. in *Phytopathology*, xxxvii, 1, p. 5, 1947.

The routine use of fungicides against potato and tomato late blight [*Phytophthora infestans*] has not hitherto been justified in eastern Virginia, where severe outbreaks of the disease occurred only twice in the 17 years from 1930 to 1946 on the former crop and once on the latter. Fungicidal treatments would, however, be valuable in years of heavy infection, and an analysis of the meteorological data for the period under review showed the feasibility of predicting such seasons by plotting the mean weekly temperature and cumulative rainfall for May and June on cross-section paper; by this means the advisability of spraying may be determined at weekly intervals during the growing season. The necessary combination for the development of widespread infection, i.e., rainfall above normal and temperatures below 75° F. from mid-May to at least mid-June, occurred only in 1938 and 1946. Tomatoes suffered from late blight only in the latter year [*R.A.M.*, xxvi, p. 136], when the low temperatures persisted throughout June.

Chester (K. S.). **Victory on the Potato front.**—*Sci. Mon., N.Y.*, lxiii, 1, pp. 73–76, 1946.

Some interesting facts are presented in this popular survey of the ravages of potato blight [*Phytophthora infestans*] and of the various control measures. In 1916 the United Kingdom potato crop was one of the poorest on record, but a well-organized spraying campaign in Ireland salvaged 1,000,000 tons that would otherwise have been destroyed. Again in 1943, one of the worst blight years in England, spraying increased yields by 25 per cent. In the United States in 1942, the fungus destroyed 25,000,000 bushels of the crop and extended its range far to the west and south, where no damage had previously been recorded [*R.A.M.*, xxii, p. 370; xxiv, p. 384]. In 1943 there was another general epidemic; in 1944 the north suffered less, but in parts of the south the disease assumed the most virulent form ever known; while in 1945 another violent outbreak reached even as far as the hitherto unscathed Great Plains. Thanks to research, however, scientists were to some extent prepared and in 1943 Dr. I. E. Melhus's forecasting service [ibid., xxiv, p. 468] was developed, thereby helping to save many millions of bushels in the threatened areas.

The shortage of copper precluded the free use of Bordeaux mixture for spraying, but the use of dithane gave excellent results in such widely separated States as Maine, Colorado, New Jersey, Wisconsin, Texas [ibid., xxiv, p. 69], and Florida [ibid., xxv, p. 43], where it is estimated to have increased the yield by 60 to 100 bush. per acre over the Bordeaux-sprayed, representing an extra $1,500,000 for the growers.

The critical shortage of spray machinery was met by the organization of 'spray rings' [ibid., xxiii, p. 276]. In Pennsylvania 100 spray rings, covering 16,000 acres on 2,300 farms, treated over one-tenth of the acreage of the State. This example was soon followed by New York, where the number of spray rings in 1944 was double that of 1943, and the system is rapidly being introduced into other States. One of the most damaging features of blight is the storage rot developing in externally sound tubers from diseased fields. During the winter of 1943–4, a quarter of the Maine crop rotted in storage, mainly from this cause. Haulm-killing to prevent the migration of the pathogen with the rain-water from the foliage to the tubers was effected by sinox, dowspray 66, and other herbicides [ibid., xxv, p. 276; xxvi, p. 78]. These preparations are also useful for the elimination of the blighted shoots emerging in the early spring from the cull potatoes on dump piles and serving as a source of inoculum for the new crops [ibid., xxii, p. 400].

Perhaps the most promising line of control, however, is the development of resistant varieties, the cultivation of which would save Maine growers alone an annual outlay of $1,000,000. Sebago and Sequoia enjoy great popularity at present,

though there are indications that the former is losing its resistance [ibid., xxiii, p. 117], but the New York-bred, fully immune Empire [ibid., xxv, p. 276], Placid, Virgil, Chenargo, and Ashworth, adapted to different regions, should be available in very limited quantities for the autumn (1946) market.

CLARK (C. F.). **The Calrose Potato: a new variety possessing resistance to late blight.**—*Amer. Potato J.*, xxiii, 10, pp. 343–347, 1946.

The new potato variety Calrose, U.S.D.A. seedling 672–26, from a cross between Katahdin and Ackersegen, is stated to have proved to be well adapted to the environmental conditions in California. Besides producing an abundant set of long and smooth tubers of attractive appearance, it is sufficiently resistant to late blight (*Phytophthora infestans*) to protect it from slight outbreaks of this disease. Its relatively long period of growth should make it suitable in regions where it is desirable to prolong the length of the harvesting and marketing period. It is susceptible to *Fusarium oxysporum* [cf. *R.A.M.*, xxiv, p. 245].

KREUTZER (W. A.), LANE (G. H.), & PASCHAL (J. L.). **Comparative effectiveness of certain knife disinfectants and the use of the double-edged knife for the control of ring rot of Potatoes.**—*Amer. Potato J.*, xxiii, 8, pp. 291–299, 1946.

Comparative tests made in 1945 in the San Luis valley of Colorado with Red McClure seed potatoes presumably free from ring rot (*Corynebacterium sepedonicum*) confirmed that boiling water or a 0·2 per cent. mercuric chloride solution for the disinfection of the rotary knife gave complete control of the disease [*R.A.M.*, xxv, p. 181]. Adequate control was not obtained with 0·5, 1, or 2 per cent. solutions of roccal and 0·2, 0·1, and 0·05 per cent. solutions of 25 per cent. hyamine 1622. Ring rot was controlled by a 2 per cent. solution of cresol (phenol co-efficient 5) which, however, adversely affected the stand of the growing plants; 1 per cent. cresol failed to give complete control.

Tests made with a stationary double-edged knife, newly devised for potato-growers, gave results equivalent to those obtained with the rotary knife. The new knife consists of a 6- to 8-in. blade sharpened on both edges and clamped upright to the edge of a cutting table. The knife is automatically disinfected by means of a short section of lamp wick fitted over the tip of the knife and connected by a small rubber tube to a 5-gal. tank containing the disinfectant, the flow of which is regulated by a metal valve at the bottom of the tank. A small metal trough at the base of the knife collects the used solution.

The risk of ring-rot infection resulting from the contact of the cut tubers with the contaminated cutting table was considerably reduced when mercuric chloride was used on the knife but not boiling water.

BONDE (R.) & SNYDER (E. G.). **Comparison of different organic and copper fungicides and some combinations of fungicides with DDT for the control of Potato diseases and insects.**—*Amer. Potato J.*, xxiii, 12, pp. 415–425, 1946.

In a spraying test carried out in 1945 in Maine on Katahdin potatoes, in which a number of fungicides were compared with Bordeaux mixture in respect of the control of late blight [*Phytophthora infestans*], early blight [*Alternaria solani*], and flea-beetle [*Epitrix cucumeris*] injury [*R.A.M.*, xxvi, p. 166], Bordeaux mixture (8–6–100), cuprocide (2–100), copper compound A (4–100), tribasic copper sulphate (4–100), basic copper arsenate (4–100), isothan Q 15 (1 pint per 100 gals.), phygon (2–3 dichloronaphthoquinone 1–4; 1–100), puratized (phenyl mercuritriethanol ammonium lactate; 0·8–100), and the control (unsprayed except against Colorado beetle [*Leptinotarsa decemlineata*]), gave, respectively, 'protective co-efficients' (ratio of the infective index [*R.A.M.*, xxi, p. 354] of Bordeaux plots, i.e., 100, to the infective index of the treatment being compared) against late blight of 100, 89, 90, 99, 89, 43, 102, 90, and 10 per cent., respectively. Against early blight the

corresponding figures were 100, 72, 81, 88, 80, 35, 78, 97, and 24 per cent.; and against flea-beetle 100, 77, 74, 68, 103, 60, 60, 60, and 20 per cent. The yields per acre were, respectively, 355, 377, 363, 363, 360, 314, 300, 297, and 303 bush.

Other plots were sprayed with Bordeaux mixture, basic copper sulphate, basic copper arsenate, fermate (2–100), karbam Z (2–100), karbam Z and soap (2–1–100), and dithane (2 qts. to 1 lb. zinc sulphate plus ½ lb. lime), and also with each plus 2 lb. 50 per cent. DDT per 100 gals. The addition of the DDT increased the yields by from 16·3 to 32·1 per cent. and also the protective co-efficients against early blight of Bordeaux mixture, basic copper sulphate, fermate, karbam Z (with soap), and dithane. The improvement is attributed to the greatly reduced number of flea-beetle punctures, which afford entry to *A. solani*, and also to the delayed plant maturity caused by DDT applications, this delay being associated with the reduction in early blight. DDT also increased the control of late blight by Bordeaux mixture, basic copper sulphate, basic copper arsenate, karbam Z (with soap), and dithane.

Much of the yield increase derived from the use of DDT in the spray fungicides resulted from a reduction in the injury caused by flea-beetles and aphids. DDT alone increased yields by 38 bush. per acre or 12·5 per cent. over the unsprayed controls. When applied at the rate of 1 lb. per 100 gals. spray mixture it reduced the aphid population by approximately 80 per cent., which greatly increased yields.

In view of these results and those of other workers it seems that Bordeaux mixture may be replaced by the neutral coppers or certain organic fungicides in combination with DDT or other insecticides.

Berkeley (G. H.), Thompson (R.W.), & Richardson (J. K.). **Potato spray tests in Ontario.**—*Amer. Potato J.*, xxiii, 8, pp. 285–290, 1 fig., 1946.

Very brief details are given of plot tests made in 1945 in Ontario in an attempt to re-assess the relative value of well-known spray and dust materials alone and combined with DDT in the control of potato diseases and insect pests [see preceding abstract]. The results, judged by the yield of tubers, indicated that DDT (4 oz. in 40 gals. water) effectively controlled insect pests, and that leafhoppers were more responsible for decreased yields than early blight (*Alternaria solani*) or late blight (*Phytophthora infestans*). Bordeaux mixture (4–4–40) and dithane zinc sulphate plus lime (2 qts.–1¼–⅝–100) gave good control of both early and late blights and yields of 311 and 333 bush. per acre; 6½ per cent. copper oxychloride sulphate (C.O.C.S.) dust, 5 per cent. copper A, and spraycop (3½–40) came next in order of effectiveness (277, 240, and 269, respectively), while fermate (1–40) and puratized (8 oz.–100) were less effective. The addition of zinc sulphate plus lime to C.O.C.S., copper A, and fermate sprays improved blight control appreciably and increased the yields. With DDT added to the various fungicides the yields ranged from 287 to 618 bush. per acre.

Denny (F. E.). **Non-transference of virus disease in treatments of Potato tubers to break dormancy.**—*Contr. Boyce Thompson Inst.*, xiv, 5, pp. 305–313, 1946.

During the treatment process for inducing early germination in potato tubers [*R.A.M.*, xxii, p. 492] cuttings of healthy tubers may come into contact with virus-infected pieces or juice. In order to investigate the possibility of the transference of potato mosaic and leaf-roll viruses by this means, 1,275 cuttings of disease-free Irish Cobbler, Katahdin, and Early Ohio potatoes of the 1943 crop were mixed, during the ethylene chlorohydrin process [loc. cit.], with cuttings of tubers infected with leaf roll or mosaic. Healthy Bliss Triumph and Green Mountain were mixed with mosaic-infected pieces only. None of the full-grown plants from the healthy cuttings developed any symptoms of the diseases. Irish Cobbler tubers from the 1944 crop infected with spindle tuber virus were used to provide contamination for 700 healthy cuttings in a similar experiment. None of the plants developing

from the latter showed any spindle tuber symptoms during growth, nor did measurements of their tubers and those of their progeny disclose any increase in the length: breadth ratio over that of the controls.

PLOTHO (O. v.). **Untersuchungen an Proactinomyceten.** [Studies on Proactinomycetes.]—*Naturwissenschaften*, xxxiii, 4, pp. 124–125, 3 figs., 1946.

The author's intensive studies at Göttingen University, Germany, on Proactinomycetes from soil samples [*R.A.M.*, xii, p. 324] of widely divergent origin have demonstrated the capacity of these organisms for the decomposition of ring compounds, such as aniline, and heterocyclic compounds, e.g., pyridine, piperidine, and nicotine, a matter of great interest in connexion with the present-day prominence of research on humus problems.

Like their near relatives the Actinomycetes, the Proactinomycetes display a bewildering pleomorphism, and the use of monospore cultures is essential to specific identification. All the strains gave rise in the first place to non-septate, more or less branched mycelium, disintegrating through septation into rods and cocci. Aerial spores are never formed, but members of the *ruber* group with red or orange pigment produce minute hyphae. On the other hand, the representatives of the groups *flavus* and *citreus*, especially the latter, form densely compressed colonies of closely packed rods. Reproduction is effected by means of resting cells, budding, and permanent forms.

Gelatine is actively liquefied by the *citreus* group, slowly and feebly by *flavus*, and not at all by *ruber*, and a similar relationship was observed in connexion with starch hydrolysis. Raffinose was the best source of sugar.

WILLIS (L. G.). **Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition. First supplement to the third edition.**—82 pp., 1940; **Botanical index to the third edition.**—24 pp., 1940; **Fourth Supplement to the third edition.**—92 pp., 1943; Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York. [Received October, 1946.]

These publications present additional abstracts, taken mainly from *Chemical Abstracts* and the *Experiment Station Record*, on all aspects of minor element nutrition [cf. *R.A.M.*, xvi, p. 276], together with an index of all the plants (including fungi) referred to in the third edition [published in 1939].

Magnesium symposium.—*Soil Sci.*, lxiii, 1, pp. 1–78, 1947.

Three of the seven papers comprising this symposium are concerned primarily with the phytopathological aspects of magnesium deficiency, namely, magnesium in citrus fertilization in Florida, by A. F. CAMP (pp. 43–52) [*R.A.M.*, xx, p. 461], magnesium nutrition of apple trees, by D. BOYNTON (pp. 53–58) [ibid., xxv, p. 180], and effect of magnesium on growth and composition of tobacco, by J. E. MCMURTREY [ibid., xvi, p. 781].

BRIERLEY (W. B.). **Mineral deficiencies in plants and their diagnosis.**—Reprinted from *Agric. Progr.*, xx, 2, 10 pp., 1945.

The author briefly examines the special problems inherent in the diagnosis of the nutritional (mineral-deficiency) diseases of plants. He considers that the study of these diseases should not be left to the agricultural chemist or plant physiologist, but should be included in the normal training of every plant pathologist to enable him to see the whole subject in its logical perspective. It is stressed that in studying nutritional and other non-parasitic plant troubles, the observer is primarily, and often entirely, dependent on visual diagnosis by clinical symptoms, the correct interpretation of which offers, however, some specific difficulties, and requires visual accuracy and considerable experience on his part. The use of coloured plates illustrating crop plants suffering from various mineral deficiencies, such as those

in 'Hunger signs in crops' [*R.A.M.*, xxi, p. 42] and in 'Diagnosis of mineral deficiencies in plants: a colour atlas and guide', by Professor T. Wallace [ibid., xxiv, p. 337], may be very helpful in this connexion, provided they are used as pointers leading to a tentative hypothesis and not as a final authority.

DARPOUX (H.). **Puccinia carthami Cda, rouille du type Brachypuccinia.** [*Puccinia carthami* Cda, a rust of the *Brachypuccinia* type.]—*Ann. Épiphyt.*, N.S., xii, *Sér. Path. vég., Mém.* 4, pp. 91–99, 6 figs., 1946.

On the 11th May, 1945, the author observed on the cotyledons of safflower at Versailles the spermagonia of a fungus, round which, a few days later, sori containing [what the author calls] primary uredospores appeared. Subsequently, true uredospores and teleutospores of *Puccinia carthami* [*R.A.M.*, xxv, pp. 319, 416] developed on these plants and others in proximity to them.

When safflower plants were grown aseptically in Erlenmeyer flasks and sterile water containing teleutospores of *P. carthami* was deposited on the cotyledons, spermagonia, and two or three days later uredospores, identical with those observed in nature, appeared after a week's incubation at 18° C. Inoculations with these uredospores gave rise to uredospores and teleutospores of *P. carthami*.

The subepidermal, later erumpent, spherical or piriform spermagonia averaged 85 to 100μ in diameter and contained hyaline, oval, or ellipsoidal spermatia, 1·5 by 2 to 3μ. The primary uredospores formed round some lesions were pulverulent, light chestnut-colour, spherical, echinulated when young, almost smooth when mature, 20 to 25μ in diameter, and were borne on a thick, hyaline pedicel arising from dikaryon cells.

Morphologically they resembled the secondary uredospores of *P. carthami*, but followed the spermagonia and took the place of aecidia; such organs have been named uredinoid aecidia by Arthur [ibid., xiii, p. 728]. Among the primary uredospores rare bicellular spores were seen. Further investigation is required before these can be regarded as aecidiospores, and meantime the author prefers to keep the term primary uredospores.

BERKELEY (G. H.). **Alfalfa mosaic on Pepper in Ontario.**—Abs. in *Phytopathology*, xxxvii, 1, p. 3, 1947.

Preliminary inoculation tests extending over a three-year period with the virus of an unusual type of mosaic observed on the California Wonder chilli variety in Ontario in 1943 and 1944 indicated a close relationship to *Marmor medicaginis* H. [lucerne mosaic virus], as also did cross-protection and thermal death-point experiments. The effects of the new virus and *M. medicaginis* vars. *typicum* and *solani* [strains of the lucerne mosaic virus] on tobacco, *Nicotiana rustica*, *N. glutinosa*, broad bean, sweet pea, pea, bean (*Phaseolus vulgaris*), red clover, chilli (*Capsicum frutescens*), soy-bean, eggplant, *Zinnia elegans*, cucumber, *Petunia hybrida*, tomato, *Antirrhinum majus*, and celery were similar except that the chilli virus did not infect tomato, while the other two did, and the chilli and typical lucerne mosaic viruses attacked cucumber, which reacted negatively to the *solani* strain. The last-named induced on *N. rustica* and *N. glutinosa* prominent calico symptoms with wide veinbanding, a feature that was absent on the same plants inoculated with the other two viruses. The chilli virus, on the other hand, caused much more severe necrosis on tobacco and the other *Nicotiana* spp. than did the other two strains of the lucerne mosaic virus.

MATHUR (R. S.). **Sugarcane red rot and its control.**—*Indian Sug.*, ix, 9, pp. 356–357, 1946.

Sugar-cane red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*] appeared in epidemic form in 1946 in several districts of the United Provinces

[*R.A.M.*, xxvi, p. 45], and the writer makes an urgent plea to growers for the immediate application of control measures, and gives a brief account of the symptomatology and mode of infection of the causal organism. By the date of writing it was assumed that the process of sporulation, which was exceptionally prolific in the highly pathogenic strain of the fungus occurring locally [ibid., xxvi, p. 144], had been completed, and the prompt harvesting of severely affected plots, particularly ratoon, was advocated. The green portions should be fed to cattle, the shrivelled canes burnt at once, and the fields prepared for rabi [chickpea: *Cicer arietinum*] cultivation. In fields where infection is limited to a few canes, roguing of the entire plant, including stubble and roots, may be practised. In such cases the green material may be used at the grower's discretion, but the desiccated canes must be burnt. After these operations the surviving crop of highly susceptible varieties, such as Co. 210, Co. 214, Co. 281, Co. 290, Co. 299, Co. 312, Co. 331, Co. 442, Co. 445, Co. 537, and Co. S5, must be crushed at the first opportunity, and the areas cleared and not replanted with sugar-cane for three years. Ratoons of susceptible varieties should be discarded. The following varieties have been tested for a number of years at research stations and may be recommended as fairly reliable for large-scale cultivation: Co. 109, Co. 146, Co. 186, Co. 245, Co. 313, Co. 356, Co. 385, Co. 393, Co. 421, Co. 453, and Co. 527. Separate, well-drained plots should be set aside for seed production. Here roguing and burning of diseased stools should be carried out at an early stage, and the setts, taken from perfectly healthy stools, should be examined for the presence of red spots on the cut ends before planting.

McMartin (A.). **Sugarcane mosaic disease and methods for its control. Report on the survey of the Government Inspectors.**—*S. Afr. Sug. J.*, xxx, 11, pp. 549, 551, 553, 555, 1 map, 1946.

The inspectors commissioned by the South African Government to ascertain the distribution of the sugar-cane mosaic virus in Natal and collect other important data relevant to the disease [*R.A.M.*, xxvi, p. 30] visited a total of 552 farms (424 on the north and 128 on the south coast), of which 82 (14·8 per cent.) were found to be harbouring the virus in the proportion of 39 (9·2) on the north and 43 (33·6) on the south coast. With very few exceptions, the disease was absent in the immediate vicinity of the sea and north of the Umvoti River. The area of infection was situated mainly in the Umzinto district, where the incidence ranged from 20 to 90 per cent., and from Avoca to Chaka's Kraal, while an outbreak was also observed at Umzimkulu. The intensity of the disease seemed to increase in the presence of natural bush, which has been left in some strips running inland. The particular strain of the virus occurring in Natal is a mild one, inducing inconspicuous symptoms and exerting no apparent ill effects on the health of the canes.

The position as regards the spread of mosaic from other crops to sugar-cane was as follows. Where maize was intercropped with cane and *Setaria sulcata* was present in the neighbourhood in a healthy state, no infection was found on the cane, but where the wild grass was attacked the virus passed to the plantation. Among the fodder grasses increasingly cultivated in Natal, *S. splendida* has been found susceptible to mosaic and should not be used; the reaction of antelope grass (*Echinochloa* sp.) is not known, but in Cuba *E. colonum* is both susceptible to the disease and a host of the vector, *Aphis maidis* [ibid., vi, p. 318].

The widely grown Co. 281 variety showed the highest incidence of infection, Co. 301 being less susceptible and also exhibiting a tendency to recovery; a few cases were further observed on Co. 331, but none on Co. 290 or N:Co. 310.

Among the recommendations for control suggested by Dr. Wager, of the Botanical Station, Durban, are the procurement of seed-cane from fields that have

been inspected and found free from mosaic; roguing of diseased plants in plant cane fields at frequent intervals, beginning when the shoots are 6 in. in height, similar measures being applicable to fields of ratoon cane with up to 10 per cent. mosaic, while those with a higher incidence should be ploughed up at the earliest possible date, and all the roots destroyed before replanting.

Cooper (V. E.) & Chilton (S. J. P.). **Occurrence of Actinomyces antibiotic to Pythium in some Sugar-cane soils of Louisiana.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 5–6, 1947.

A survey was made in 1946 of a soil-inhabiting *Actinomyces* antibiotic to the species of *Pythium* responsible for sugar-cane root rot in Louisiana, including *P. dissotocum* and *P. periilum* [*R.A.M.*, xix, p. 435]. Of 3,788 cultures tested against a parasitic strain of *Pythium*, 896 (23·6 per cent.) showed varying degrees of antibiosis, 365 inhibiting the advance of the pathogen in Petri dishes at 1 to 5 mm., 301 at 6 to 10, 140 at 11 to 15, 90 at 16 and upwards, and 10 at 35 or more. A progressive increase of the *Actinomyces* populations in the soil occurred from March to August, but the percentage of antibiotic strains decreased. The proportion of antibiotic strains and their average capacity for inhibitory action was lower in the heavy soils favouring the disease than in lighter ones.

Swingle (D. B.). **A textbook of systematic botany. Third edition.**—xv+343 pp., 1 col. pl., 57 figs., 47 diags., 2 maps, New York and London, McGraw-Hill Book Company, 1946. 17*s.* 6*d.*

This manual, devoted primarily to phanerogams, contains much that is of interest to the systematic mycologist, including notes on the use of keys in identification, a discussion of floral formulae, directions for the preparation of herbaria, and chapters on nomenclature, the principles of taxonomy, systems of taxonomy, and the literature of systematic botany, with frequent references to items applicable to the classification of fungi.

Guyot (A. L.). **Contribution à l'étude des cryptogames parasites du sud-est de la France et de l'Afrique septentrionale.** [A contribution to the study of the parasitic fungi of south-eastern France and north Africa.]—*Ann. Éc. Agric. Grignon*, Sér. 3, v, pp. 20–29, 1945–1946.

This annotated list of fungi collected by the author in south-eastern France, Algeria [*R.A.M.*, xxvi, p. 130], and Tunisia (with some found by C. Chabrolin and J. Fortin) includes *Sorosporium saponariae* [ibid., xxv, p. 12] on wild *Dianthus caryophyllus* in the Alpes-Maritimes, *Septoria graminum* [*S. tritici*: ibid., xxv, p. 155] on *Briza maxima* in two localities in Var, *Entyloma calendulae* [ibid., xx, p. 119; xxiii, p. 475] on *Calendula arvensis* and *C. algeriensis*, *E. calendulae* f.sp. *chrysanthemi* n.f. on *Chrysanthemum coronarium*, a new host for *E. calendulae*, and *Tuburcinia* [*Urocystis*] *tritici* on wheat and *Triticum durum* at Tunis, and *Ustilago hordei* and *U. nuda* on cultivated barley, both found at Kaurouan, Tunisia.

de Sousa da Câmara (E.) & Branquinho de Oliveira (A. L.). **Contributio fungorum minima in Lusitania collectorum. I. Oomycales.** [A small contribution of fungi collected in Portugal. I. Oomycales.]—*Agron. lusit.*, vi, 3, pp. 301–314, 2 pl., 1 fig., 1944. [Received February, 1947.]

Included in this first instalment of 39 entries towards the authors' contribution to the mycoflora of Portugal [cf. *R.A.M.*, xxv, p. 47] are *Synchytrium endobioticum* on potato in Lisbon [ibid., xii, p. 672], *Peronospora* [or *Pseudoperonospora*] *cannabina* on hemp [ibid., xix, p. 435] near Santarem and Torres-Novas, *Peronospora coronillicola* n.sp. on *Coronilla glauca* at Sacavem, and *Phytophthora hibernalis*,

collected in 1943 on the leaves and fruits of orange, grapefruit, and citron [ibid., xxii, p. 354 *et passim*].

SEMADENI (F. O.) & GÄUMANN (E.). **Über den Formenkreis der Puccinia bistortae (Str.) DC.** [On the form-cycle of *Puccinia bistortae* (Str.) DC.]—*Ber. schweiz. bot. Ges.*, lv, pp. 146–150, 2 graphs, 1945.

In the canton of Grisons, Switzerland, *Puccinia cari-bistortae* Kleb. forms its teleutospores on *Polygonum bistorta* and *P. viviparum* and its aecidial stage on *Angelica sylvestris* and caraway (*Carum carvi*). In 1942, however, the range of the haplophase was extended by successful inoculation experiments with an Alpine collection of the rust on *Chaerophyllum hirsutum*, anise (*Pimpinella anisum*), and *P. peregrina*, not hitherto recorded as hosts. Aecidiospores of *Puccinia cari-bistortae* from *C. hirsutum* infected both *Polygonum bistorta* and *P. viviparum*. The plurivorous Alpine form of the rust is in complete morphological agreement with the type species, and the purely biological distinguishing character of the former may be expressed by the designation f.sp. *alpina*. At the same time the addition of f.sp. *angelicae-bistortae* Kleb. to the name of the type species is proposed.

JENKINS (A. E.), BITANCOURT (A. A.), & POLLACK (F. G.). **Spot anthracnoses in the United States.**—*J. Wash. Acad. Sci.*, xxxvi, 12, pp. 416–421, 2 figs., 1946.

Additional records of spot anthracnoses (*Sphaceloma* and *Elsinoe* spp.) in the Pacific Coast States [*R.A.M.*, xxv, p. 563; cf. ibid., xxvi, p. 31] have become available through the work from 1943 to 1945 of the special survey in the general vicinity of ports of entry of the U.S. Bureau of Entomology and Plant Quarantine [ibid., xxv, p. 292]. They include *S.* sp. on *Rhododendron macrophyllum*, *E.* sp. on *Gaultheria shallon*, in association with *Phyllosticta gaultheriae*, both in Washington, *S.* (?) *mattirolianum* on *Arbutus unedo* [ibid., xiii, p. 661] and *A. menziesii* in California (believed to be the first record of the pathogen in the United States), *S. ribis* n.sp. Jenk. & Bitanc. on gooseberry in Washington, *S. viburni* n.sp. Jenk. & Bitanc. on *Viburnum opulus* var. *roseum* and *V. suspensum* in Washington and California, *S. cercocarpi* n.sp. Bitanc. & Jenk. on *Cercocarpus betifolius* var. *multiflorus* in California, and *S. hederae* n.sp. Bitanc. & Jenk. on ivy in California, North Carolina, and São Paulo, Brazil.

S. ribis, the agent of gooseberry scab, produces on the foliage numerous convex spots, sometimes circular or subcircular on the veins, mostly up to 1 mm. in diameter, grey with an inconspicuous, yellow margin, dotted with black, erumpent acervuli, up to 63 by 40μ; the conidiophores are dark, continuous or triseptate, up to 15μ long, arising from a pallid stroma, and the conidia variable, hyaline or coloured, spherical, up to 3μ in diameter, or elliptical, 8 by 5μ.

The convex spots formed by *S. viburni* on the leaves of the above-mentioned *V.* spp. are circular to triangular or irregular, tending to follow the veins or margins, up to 2 mm. in diameter or more or less diffuse, with grey to white centres and brown edges, sometimes dotted with black, erumpent, compact, pulvinate, acervuli up to 61 to 100μ in diameter and 21 to 50μ in thickness. Conidia were not observed.

S. cercocarpi produces on *C. betulifolius* var. *multiflorus* leaves scattered or marginal, convex, circular or subcircular, sometimes coalescent spots, up to 3 mm. in diameter, with pale centres bearing papuliform, erumpent, compact, pallid, sometimes confluent acervuli, 57 to 60μ in diameter and 44 to 70μ in thickness, and sometimes slightly raised, purple margins. Conidia were not observed.

Ivy leaves attacked by *S. hederae* bear numerous scattered or densely aggregated, circular or subcircular, verruciform, concave, often confluent spots, 1 to 5 mm. in diameter, brown with a pale to dark centre; the straight or curved, mostly acute, commonly continuous, occasionally triseptate conidiophores arise from

intraepidermal hyphae in fascicles up to 53 to 200μ in diameter and measure up to 47 by 5·3μ, and the hyaline or coloured conidia may be either spherical, up to 6μ in diameter, or elliptical, 2·5 to 7·8 by 1·7 to 5·3μ.

MILLER (J. J.). **Cultural and taxonomic studies on certain Fusaria. I. Mutation in culture.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 188–212, 3 pl., 1946.

This work was undertaken with a view to determining whether the tendency of the 'wild-type' isolates of the *Fusarium* [*F. bulbigenum* var. *niveum*] of muskmelon wilt [*R.A.M.*, xxv, p. 249] to form mutants is shown by other species. Examination of the abnormal areas appearing in single-spore cultures of 13 isolates from different sources representing the section *Elegans*, and three *Liseola*, *Discolor*, and *Gibbosum*, respectively, showed the larger areas to be of mutant origin, as single-spore cultures from them were predominantly purely mutant in form. Chlamydospores were more abundant in the mutants. The 'sclerotia' observed in cultures of some of these organisms may putatively be considered of mutant origin also, sclerotial cultures being obtained from mutants of the pea isolate. A comparison of the morphological and cultural features of the patch mutants with those of sporodochia described in literature suggested that these terms are synonymous. As some patch mutants produce abundant macroconidia the value of the common practice of measuring macroconidia from sporodochia for taxonomic purposes is questioned [ibid., xxv, p. 366]. It was shown, too, that of cultures derived from rapidly germinating spores 64 per cent. were mutant, whereas slower ones gave only 34 per cent. of mutants on the average. The ready displacement in culture of the wild types of *Fusaria* by mutants indicated that some method of maintaining the original isolates in the pure state is indispensable to a consistent taxonomy of the genus. It is recommended that *Fusaria* should be kept in tubes of sterilized soil; this method of cultural treatment, having been shown experimentally not to yield mutants (except in the case of the flax and cotton strains which gave a low percentage), will assist the retention of the wild type.

The muskmelon *Fusarium* was shown by experiment to have retained its viability after three years in dry soil culture and to have undergone no change in cultural form and suffered no loss of virulence during that time. The other strains studied were still viable after 13 months or more under similar conditions.

Further experiments on cultural interaction [ibid., xxiv, p. 351] lend support to the suggestion that it can be used as a taxonomic criterion, and two saprophytic strains were separated by this means. After reviewing and rejecting various theories which have been put forward to explain cultural variation the author maintains that the weight of evidence favours the view it is due to mutation. The production of mutants in nature is considered to be relatively infrequent. The author stresses the importance of making comparisons as soon as possible after isolation unless great care is taken to preserve the purity of the originals. Where differences in cultural appearance or host specialization, or both, are noted among the original isolates, these should be regarded as separate wild types of the organism concerned.

MILLER (J. J.). **Cultural and taxonomic studies on certain Fusaria. II. The taxonomic problem in Fusarium with particular reference to section Elegans.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 213–223, 1946.

In this second study of certain '*Fusaria*' [see preceding abstract] the conclusion that the 'normal' culture of certain specialists [*R.A.M.*, iv, p. 706] represents the dominance of the original or wild type by a mutant, and that the sporodochia appearing in cultures of *Fusarium* are actually patch mutants, is shown to bear conspicuously on the taxonomy of the genus. Macroconidia, for example, of different mutants of one strain have been found to differ in length, width, and

curvature, and even those of one mutant may differ among themselves [cf. ibid., xxv, p. 366]. The implication is that the species descriptions of many '*Fusaria*' based largely on these 'normal' cultures are really of cultural variants; if confusion is to be avoided, they should be based only on the characters of the wild types. While the close similarity of the components of certain groups of '*Fusaria*' may make morphological separation of wild types within them extremely difficult, the wide range of variation exhibited by these organisms in artificial media should not deter workers from this task. Only where morphological separation is extremely difficult, or where variability in nature makes consistent diagnosis uncertain, should species be merged.

Working with 13 different wild-type isolates of the section *Elegans* the author was able to distinguish between them morphologically and gives a key for their determination. He considers that the 'wild-type' concept is similar to Padwick's suggestion that the taxonomy of the genus must be based on field work [ibid., xxi, p. 428]. Objections to the systems of Snyder and Hansen [ibid., xix, p. 495] and Wollenweber and Reinking [ibid., xiv, p. 708; xxiii, p. 410] are raised, but it is considered that the differences between them may be reconciled.

Viégas (A. P.). **Alguns fungos do Brasil. XII. Fungi Imperfecti—Melancoliales.** [Some fungi of Brazil. XII. Fungi Imperfecti—Melancoliales.]—*Bragantia, S. Paulo*, vi, 1, pp. 1–37, 11 pl., 2 figs., 1946.

This further contribution to the author's studies on Brazilian fungi [cf. *R.A.M.*, xxvi, p. 129] includes *Colletotrichum andropogonis* on sorghum [ibid., xviii, p. 517], *C. coffeanum* [*Glomerella cingulata*] on coffee [ibid., xxvi, p. 105 and above, p. 198], *C. eucalypti* Bitanc. on *Eucalyptus* sp., *C. falcatum* [*Physalospora tucumanensis*] on P.O.J. 2714 sugar-cane leaves [ibid., ix, p. 808; xviii, p. 619], *C.* [*Glomerella*] *gossypii* and *C. gossypii* var. *cephalosporioides* on cotton [ibid., xviii, p. 798], *C. lagenarium* on the Leesburg melon variety and *Sechium edule*, *C.* [*Gloeosporium*] *manihotis* on cassava [ibid., xx, p. 564], *Cylindrosporium mori* on mulberry [ibid., xxii, p. 53], *Fabraea maculata* on quince, loquat [ibid., xxii, p. 364], and pear, *G. papayae* on papaw [ibid., xxvi, p. 114], *G. passiflorae* on *Passiflora* sp., *G. vanillae* Cooke [ibid., vi, p. 695] on leaves of Orchidaceae, *Melanconium bambusinum* on *Bambusa pallescens*, *M. fuligineum* on grapes [ibid., xxii, p. 126], and *Pestalotia dichaeta* on *Anacardium occidentale*, *Eucalyptus* sp., and mango.

Gilmore (L. E.). **The role of calcium, phosphorus, sulphur and superphosphate for Tobacco.**—*Sci. Agric.*, xxvii, 1, pp. 21–32, 1947.

In examining commercial calcium superphosphate as a fertilizer for tobacco a preliminary survey of the literature concerning the part played in plant nutrition by the three elements present, calcium, phosphorus [*R.A.M.*, xv, p. 263], and sulphur, is made. The effect of each on growth, yield, and quality of tobacco, and on soil reaction, is considered.

Calcium deficiency is uncommon because of the heavy fertilizer dressings usually applied, but when it does occur it causes stunting with browning and death of the terminal bud. Phosphorus deficiency also induces stunting and causes the leaves to become dark green, shiny, leathery, and narrowed at the base. In greenhouse experiments sulphur deficiency resulted in pale green leaves with white veins.

Concerning the soil reaction, its pH value bears an important relation to the development of black root rot [*Thielaviopsis basicola*: ibid., x, p. 762; xxv, p. 583] to which 80 per cent. of Canadian tobacco is susceptible. Values of over 6·4 encourage the pathogen, while values below 4·8 give a low yield of tobacco, accompanied by manganese poisoning. Soils with pH values between 5 and 5·6 produce the most satisfactory crops. As most Canadian tobacco soils are acid in reaction it is important to maintain the favourable pH range.

Davis (B. H.) & Haenseler (C. M.). **Control of late blight of Tomato in New Jersey.**—Abs. in *Phytopathology*, xxxvii, 1, p. 6, 1947.

Tomato late blight (*Phytophthora infestans*) [*R.A.M.*, xxvi, p. 176 and above, p. 210] became prevalent in the canning areas of New Jersey during the first week in July and thenceforth spread almost continuously, reaching a peak of fruit destruction from 20th to 25th August. Spraying experiments were begun in a commercial field three days after the detection of scattered foliar infection, eight treatments being given at ten-day intervals, using a five-row power take-off sprayer with three nozzles per row, with (1) microgel, a tribasic copper sulphate containing 50 per cent. copper (4–100) [*R.A.M.*, xxiv, p. 266], (2) fermate (2–100) alternating with microgel, and (3) zerlate (2–100), each with an admixture of calcium arsenate (4–100), while the control plots were given (4) calcium arsenate and lime (4–8–100). The calculated yields in tons of marketed fruits per acre (based on the examination of 100 tomatoes in each treatment) were as follows: (1) 27·7, (2) 21·4, (3) 13·8, and (4) 10·2, of which 0·2, 2, 13·3, and 10·8 per cent., respectively, were slightly infected, while of the total quantity of fruits produced 0·7, 12·1, 55·9, and 59·8 per cent., respectively, were infected.

Report on Tomato blight and plant conference.—*Food Packer*, xxviii, 1, pp. 74, 76, 1947.

At a conference held at Indianapolis under the joint auspices of the National Canners' Association and the Indiana Canners' Association, which was visited by phytopathological and tomato specialists from 12 States, the committee on disease control expressed the opinion that control programmes should take into account not only late blight [*Phytophthora infestans*: see preceding abstract] (the immediate concern of the conference), but other leaf pathogens, e.g., *Septoria* [*lycopersici*], early blight [*Alternaria solani*], anthracnose [*Colletotrichum phomoides*], and leaf mould [*Cladosporium fulvum*]. Control measures should include autumn ploughing where practicable; rotation, avoiding tomatoes in succession to the same crop, potatoes, or other Solanaceae; wider spacing, allowing preferably 5½ to 6 ft. between rows and 2½ to 4 ft. between plants; the application of either of the two following spraying schedules: (1) zerlate alone (2–100), unless *P. infestans* or *S. lycopersici* threaten, in which case it should be replaced by fixed coppers (4–100), Bordeaux mixture, or dithane; (2) three zerlate alternating with two copper sprays. In either case treatment should begin about 30 days after the first cluster-bloom and continue thereafter at 10-day intervals or thereabouts, according to weather conditions. If an outbreak of late blight is anticipated, spraying should start earlier, using the coppers. Dusts are not generally as effective as sprays, but where they are used a 7 per cent. copper and a 10 per cent. zerlate dust, separately or together, should be applied weekly at the rate of 40 to 50 lb. per acre. In the application of the schedules, special attention should be directed to any fields, areas, or soil types where (1) leaf diseases have given trouble in the past, (2) adequate rotations are impracticable, or (3) during long, wet periods conducive to foliar diseases.

Gäumann (E.), Jaag (O.), & Braun (R.). **Antibiotika als pflanzliche Plasmagifte.** [Antibiotics as plant plasma toxins.]—*Experientia*, iii, 2, pp. 70–71, 1947. [English summary.]

In experiments on red beets and *Elodea canadensis*, lycomarasmin, the wilting agent produced by *Fusarium* [*bulbigenum*] var. *lycopersici* [*R.A.M.*, xxv, p. 424], did not destroy the semi-permeability of the plasma layer, but patulin (clavacin), derived from *Penicillium patulum*, *P. expansum*, *Aspergillus clavatus*, etc. [ibid., xxiii, p. 183], did so. In similar tests with *Chlamydomonas* lycomarasmin was also

less toxic than clavacin, while of the two Protozoa tested, *Colpidium* proved more sensitive to lycomarasmin and *Paramaecium caudatum* to clavacin.

Lansade (M.). **Recherches sur le chancre du Peuplier en France.** [Researches on Poplar canker in France.]—*Ann. Épiphyt.*, N.S., xii, 1, pp. 23–39, 4 figs., 1946.

Preliminary investigations into poplar canker [*R.A.M.*, xiv, p. 478; xxv, p. 323] in France showed the presence of three main types of injury, viz., bark lesions, typical canker, and tumours. From the first, a species of *Diaporthe* was isolated from some trees and an organism closely resembling *Bacterium* [*Pseudomonas*] *syringae* from others; the second gave *Diaporthe* in some trees and a species of *Nectria* in others; while no organism was obtained from the tumours. Four isolates of *Diaporthe* were cultured, which appeared to fall into two groups, one (isolates 4 and 21) showing sparse perithecia in culture, a pycnidial stage of the *Fusicoccum* type, and ascospores obtuse at either extremity, and the other (isolates 23 and 26) with numerous perithecia, no pycnidial stage, and ascospores slightly mucronate at the extremities. In isolates 4, 21, 23, and 26, respectively, the perithecia averaged 304·3, 355·9, 355, and 392μ high by 271·9, 308·7, 292·9, and 290·4μ thick, the asci 48 by 6·4, 49·1 by 5·5, 46·4 by 5·3, and 46·6 by 4·7μ, and the ascospores 11·1 by 2·59, 10·9 by 2·18, 11·3 by 2·6, and 11·1 by 2·75μ. Inoculations of healthy poplars with isolate 4 gave rise to an extensive bark canker, and with 21 positive infection, the fungus penetrating the bark and showing a certain parasitic ability.

Five isolates of *Nectria* in culture produced only conidia; these were 69 to 97 by 5·25 to 7·5μ. On the cankers, the bright reddish perithecia were 230 to 370μ high by 150 to 300μ thick, the asci were 70 to 80 by 6μ and contained light, bicellular ascospores 10·5 to 15 by 3·75 to 8μ. Inoculations of healthy poplars with isolate 24 gave rise to the beginning of an open canker which did not seem likely to heal up.

Inoculations with the organism resembling *P. syringae* showed it to be parasitic on the herbaceous organs of poplar, lignification of the tissues rapidly arresting its progress. Its action was confined, in spring, to the destruction of leafy shoots and young bark; this organism hardly seemed able to cause typical cankers. The two isolates used for the inoculations were obtained from fissured lesions on one-year-old twigs of *Populus koreana* and *P. simonii*, both highly susceptible to frost injury. Further work is in progress.

Boudru (M.). **La rouille 'suisse' des aiguilles du Sapin de Douglas.** ['Swiss' rust of the needles of Douglas Fir.]—*Bull. Soc. for. Belg.*, lii, 7–8, pp. 60–68, 1 pl., 1945.

A brief account is given of the morphology, taxonomy, symptoms, development, and geographical distribution of needle cast (*Phaeocryptopus gaeumanni*) of Douglas fir (*Pseudotsuga taxifolia*) [*R.A.M.*, xvii, p. 638; xxv, p. 428]. The disease was found in July, 1943, in the arboretum at St. Michel (St. Hubert), Belgium, on two non-contiguous groups of trees (green variety) planted in 1925. The affected trees were completely bare, except for a small bunch of the current season's needles. Other Douglas firs in their immediate proximity and elsewhere in the vicinity were unaffected. At the time, no other cases were known in Belgium, but subsequently the disease was observed in several other localities.

Boudru (M.). **La rouille des aiguilles du Thuya géant (Thuja plicata Don).** [Needle rust of the giant *Thuya* (*Thuja plicata* Don).]—*Bull. Soc. for. Belg.*, lii, 7–8, pp. 69–75, 6 figs., 1945.

A brief account is given of the symptoms, causal organism, and control in the nursery of the disease of *Thuja plicata* seedlings caused by *Keithia* [*Didymascella*]

thujina [*R.A.M.*, viii, p. 279; xxv, p. 18], which for some years past has decimated the young nursery trees at Groenendael, Belgium, though, apparently, it has not previously been recorded in that country. *Coryneum thujinum* occurred occasionally on the same needles as *D. thujina*. From dead infected leaves kept in a moist chamber the author also isolated a fungus closely resembling *Pestalozzia funerea* [ibid., ix, p. 145.].

HINTIKKA (T. J.). **Ruskotäplistä Thuya occidentalis en puusa.** [Brown spots in the wood of *Thuja occidentalis*.]—*Memor. Soc. Fauna Flora fenn., 1940–1*, xvii, pp. 279–283, 2 figs., 1942. [Received February, 1947. German summary.]

The elongated, brown, apparently resinous areas seen in transverse sections of the trunk of a *Thuja occidentalis* blown down by a storm in the garden of a Finnish horticultural institute in 1925 were surrounded by a white rot attributed to *Armillaria mellea*. The tree is believed to have reacted to the stimulus of the parasite by the production of adventitious buds (blastomania), the death of which was followed by the development of the brown zones.

ROBAK (H.). **Tre skogsykdommer som hittil har vaert lite kjent eller påaktet i Norge.** [Three forest diseases which have hitherto been little known or heeded in Norway.]—*Tidsskr. Skogbr., 1946*, 10–11, pp. 323–334, 2 figs., 1946.

Jørstad has published the available information [*R.A.M.*, xxv, p. 184] as to the distribution of *Phomopsis pseudotsugae* on Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] and other conifers in Norway, where it was first discovered by Hahn in 1925 [ibid., x, p. 278]. The earliest record for the country of the fungus on larch dates from 1943, when the author detected it at Svarstad, Bremanger; in 1944 a number of further collections were made in various localities. The symptoms of infection were absolutely uniform on all the trees examined, the three- to five-year-old branches being dead and the needles shrivelled. The desiccation had evidently taken place suddenly, when the needles were almost or quite fully grown. The necrotic area of the branch is fairly well differentiated from the healthy part below it, but in some of the cases investigated the line of demarcation was not as sharp as in Ferdinandsen and Jørgensen's illustration [ibid., xviii, p. 212]. A copious flow of clear resin was generally exuded from the base of the dead branch, at and a short distance above which were formed the pycnidia of the fungus. In 1945 *Phomopsis pseudotsugae* was observed on two 11-year-old *Larix leptolepis* trees, and in 1946 on a 19-year-old specimen of the same host; on these larches some of the older branches had also been killed. In 1946, moreover, one of the lowest branches of an outside tree in a thriving 39-year-old plantation was found to have been killed by the fungus in the previous year.

The modest extent of the damage hitherto inflicted by *P. pseudotsugae* in Norway does not preclude the possibility of future severe outbreaks under more propitious meteorological conditions. In the meantime the sporadic distribution of the pathogen should facilitate the wise precaution of cutting off and burning any dead branches as soon as they are detected in the spring.

According to Jørstad [*op. cit.*] there was only one Norwegian record, dating from 1900, of *Meria laricis* on larch [ibid., xxiv, p. 37] before the present writer encountered the needle-fall in three plantings near Førde, in two of which the trees were just under or over 20 and in the other about 13 years old. When the older plantations were revisited in 1946, the trees had largely recovered from the effects of the disease, which included withering of practically the entire crown and shedding of the current year's needles. The younger stand, however, presented a very unthrifty appearance when first inspected, many of the trees being dead and others stunted, while the needles were either desiccated or fallen. Later in the same year the disease was observed in an advanced stage on about ten trees in a small

11-year-old planting, and further cases of mild or limited infection on 15-to 20-year-old larches were inspected in different localities. In 1946 *L. sibirica* and *L. leptolepis* were also found to be attacked, the damage to the former being appreciable. On the 40-year-old European larches and 10-year-old *L. leptolepis* in a mixed planting the symptoms were almost imperceptible to an untrained eye.

Thirty-year-old spruces were observed in 1942 to be severely infected by *Discella strobilina* (Desm.) Died. (*Ascochyta parasitica* (Hart.) Rostr.) [*A. piniperda*: ibid., xii, p. 667], which had evidently been established on the trees for some years. The young growth killed by the fungus had been largely replaced by adventitious shoots, some of which were also infected: roots and stems were healthy.

Bier (J. E.) & Nobles (Mildred K.). **Brown pocket rot of Sitka Spruce.**—*Canad. J. Res.*, Sect. C, xxiv, 6, pp. 115–120, 3 figs., 1 pl., 1946.

A brown pocket rot of Sitka spruce (*Picea sitchensis*), caused by *Lentinus kauffmanii* n.sp., occurs in patches in the Queen Charlotte Islands, British Columbia, and is responsible for the decay of the merchantable timber of many of the largest trees, while producing no external symptoms in living trees. This rot appears to be identical with an unidentified pocket rot briefly described by Mounce in 1926 [*R.A.M.*, vi, p. 265].

The disease is distributed quite generally in the Islands; cultures have been isolated from trees in Alaska, Washington, and Oregon, and sporophores have been reported on spruce in California, so that the distribution probably coincides with that of the spruce. The fungus causes brown pockets of decay in the heartwood and occurs most frequently in the lowest 80 ft. of the trunk. The first indications of infection are minute, discoloured pockets which increase in size and become filled with a crumbly, brown mass, readily breaking into cubes with felts of white mycelium in the cracks. Finally the decayed wood drops out, leaving lens-shaped cavities edged with rot, 12 to 24 by 4 to 8 in., elongated in the direction of the grain. Although distinctly delimited at first, the pockets eventually coalesce to form a continuous cavity. Because of the localized nature of the rot, it is impossible to estimate the decay from the cut ends of the trunk. Of 1,977 trees examined, 1,414 were infected with some fungus and of these 91 were cases of brown pocket rot, which was sixth on the frequency list of decay-producing fungi. In these trees 11·5 per cent. of the total merchantable timber was destroyed by decay, of which 0·9 per cent. was due to brown pocket rot, a percentage exceeded only by cork rot (*Fomes pini*) [ibid., xxv, p. 531], brown butt rot (*Polyporus schweinitzii*) [ibid., xx, p. 552], and brown crumbly rot (*F. pinicola*) [ibid., xix, p. 445; xx, p. 1, *et passim*]. In grade 1 logs 7·6 per cent. of the timber was decayed, 1·6 per cent. being due to the brown pocket rot, a percentage exceeded only by brown butt rot. There is no foundation for the popular belief that the rot affects every tree in a group.

An analysis of the entry points of the fungus indicates that in 56 per cent. entry is through the roots, in 39 per cent. through scars or branch stubs, and in 5 per cent. through dead tops.

No outward symptoms were observed in standing trees. The sporophores develop only on felled and exposed timber, usually in May, June, September, and October on the rim of decayed pockets. The causal fungus appeared to be an undescribed species, and a full description is presented by Dr. A. H. Smith of Michigan University, who named it. The dry, glabrous, convex pileus, 3 to 8 cm. broad, with a margin at first incurved and later wavy or lobed, varies from buff to dull tan, has tough, cartilaginous, pinkish flesh, crowded, adnate gills, decurrent by ridges extending 1 to 2 cm. down the stipe, and smooth, hyaline, subcylindrical or slightly curved spores 5 to 6 by 2μ; the stipe is 3 to 6 cm. by 5 to 12 mm., equal, solid, central to nearly lateral, and concolorous; cystidia are abundant, and subcylindrical

to ventricose. It differs from *L. umbilicatus* in lacking the acrid taste, and in its spores and convex pileus, and from *L. adhaerens* [ibid., xv, p. 332], which it otherwise closely resembles, in lacking the viscidity, odour, and taste of that species, and in the smaller size of its spores.

Cultures obtained from spores, fruit bodies, and infected wood were characterized by a strong-smelling mycelium, white when young, pinkish-buff when old, and developing scattered, compact nodules 1 to 10 mm. in diameter, with a felty to skin-like surface and of a quite distinctive appearance. The advancing hyphae were thin-walled and branched with clamp-connexions, while the aerial hyphae became nodose-septate or fibrous and thick-walled.

Riker (A. J.), Gruenhagen (R. H.), Roth (L. F.), & Brener (W. H.). **Some chemical treatments and their influence on damping-off, weed control, and winter injury of Red Pine seedlings.**—*J. agric. Res.*, lxxiv, 3, pp. 87–95, 1947.

A tabulated account is given of greenhouse and nursery experiments in Wisconsin between 1937 and 1945 in the control of red pine (*Pinus resinosa*) seedling damping-off (*Pythium irregulare* and *Rhizoctonia* [*Corticum*] *solani*) [*R.A.M.*, xxiii, p. 197], the object of which was to find a treatment combining toxicity to the pathogens with freedom from the adverse effects of dilute sulphuric acid on the nutritional balance in sandy soils. Scots and Austrian pine (*Pinus sylvestris* and *P. nigra* [var. *austriaca*]) were included in some of the trials. Reasonably satisfactory results were secured by seed treatment with a mixture of 8 per cent. mercuric phenyl cyanamide and 2·5 per cent. cadmium oxide (barbak C), supplemented by the application to the soil of calomel [mercurous chloride] at the rate of 0·4 gm. per sq. ft. In a limited number of trials, moreover, a soil treatment with tetramethyl thiuramdisulphide [Du Bay 1205–FF] was relatively effective not only against damping-off but also in the elimination of weeds and protection from winter injury.

Bazan de Segura (C.). **Una nueva enfermedad del Haba (Vicia faba L.) en el Peru.** [A new disease of the Broad Bean (*Vicia faba* L.) in Peru.]—*Agronomia, Lima*, x, 42, pp. 49–52, 3 figs., 1945. [English summary.]

A new disease of broad beans (*Vicia faba*) in Peru is characterized by the presence on the pods of roughly spherical, black, water-soaked, velvety spots which coalesce to cover almost the entire surface. The fungus isolated from the infected tissues was identified as a species of *Phoma* with a white, later greyish, cottony mycelium, giving rise to numerous more or less globose, black pycnidia with a circular ostiole, and minute, elliptical, straight, hyaline, frequently biguttulate conidia. Positive results were obtained in inoculation experiments with the pathogen, which is suspected to be identical with *P. subcircinata*, the agent of a very similar infection of beans [*Phaseolus vulgaris*] in the United States [*R.A.M.*, xxiv, p. 260].

Marked damage by brown stem rot.—*Soybean Dig.*, vii, 1, p. 17, 1946.

According to B. Koehler, Illinois soy-bean crops sustained heavy damage from brown stem rot in the autumn of 1946. First discovered in the autumn of 1944, the disease has continued to spread and become increasingly serious. The most prominent external symptoms are the blanching and brown discoloration of the interveinal foliar tissues, while the interior of the stems, especially near the base, is also brown. Pending further investigations, the best suggestions that can be made for control are crop rotation, including soy-beans only once in three or four years, the application of limestone where needed, and a well-balanced soil fertility programme. The [unnamed] pathogen is soil-borne, and infection does not appear to be carried on the seed.

Middleton (J. T.). **Pythium crown rot of Rhubarb.**—*Bull. Torrey bot. Cl.*, lxxiv, 1, pp. 1–8, 2 figs., 1947.

This fuller account of a crown rot of rhubarb associated with several species of *Pythium* [*R.A.M.*, xxi, p. 119] observed in March, 1936, near San Francisco Bay, and in February, 1940, near Los Angeles, contains the following additional information. Plants in several fields in each locality were affected, and it was apparent that the disease occurs regardless of soil type and irrigation practice. The infected plants usually wilted, the leaves then turning yellow and collapsing. The bases of the petioles generally showed sunken, longitudinal, brown streaks $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, extending upwards for 2 to 3 in. Some young buds escaped infection until at or above soil-level, although the disease seldom developed much above ground-level; when it did, its progress depended upon the presence of a moist atmosphere. In some plants only the roots were attacked, the cortex becoming flaccid and water-soaked.

Isolations from affected material gave *P. anandrum*, *P. oligandrum* [ibid., xxvi, p. 132], *P. ultimum*, *P. irregulare*, and *P. splendens*, the last two new records for rhubarb. The minimum, optimum, and maximum growth temperatures were usual for the five species. All were found by inoculation to be pathogenic to 2-, 6-, and 12-month-old rhubarb plants, *P. ultimum* being the most and *P. irregulare* and *P. oligandrum* the least virulent.

Asthana (R. P.). **Bacterial leaf-spot on Arum.**—*Curr. Sci.*, xv, 12, p. 356, 1946.

In July, 1944, *Colocasia antiquorum* leaves in the Nagpur district of India were observed to bear round to oval, dark sage-green spots, roughly disposed in streaks, which in three to four weeks attained a diameter of 0·5 mm. to 1 cm. and later coalesced to form larger pale yellow to light brown patches. The streaks were mostly on the upper surface and during the rainy season only a few scattered lesions developed on the lower, but in the winter they were equally prominent on both, those on the under side being eucalyptus-green. The affected foliage lost its lustre, shrivelled from the margins inwards, and died after a few days. The disease was promoted by an excess of soil and atmospheric humidity and was more severe on young than on older leaves. The disease also attacked *Alocasia indica* and caused considerable losses in both plants. The bacterium isolated from infected material formed round, smooth, sunken colonies on glucose agar, while on agar streaks the growth was smooth, soft, spreading, with a slimy, finely ridged surface. The organism is motile, highly refractive, rod-shaped, 1·33 to 3·13 by 0·66 to 1·33 (average 2·13 by 0·93) μ. Inoculation experiments gave positive results on both leaf surfaces, the symptoms appearing within 24 hours on the lower and 48 on the upper side during the rainy months and after three to four days in the winter. Re-isolations from the infected leaves yielded the same organism, which has not yet been identified. Cross-sections through the diseased foliage revealed its presence in the parenchymatous tissues and palisade cells.

Françot (P.) & Levadoux (L.). **Observations faites en 1945 sur le brenner ou rougeot parasitaire de la Vigne.** [Observations made in 1945 on 'brenner' or parasitic 'rougeot' of the Vine.]—*Progr. agric. vitic.*, cxxv, 14–15, pp. 226–227, 1946.

During 1945, 'brenner' disease (*Pseudopeziza tracheiphila*) [*R.A.M.*, xxv, p. 327 and next abstract] caused important losses in several vine-growing areas of France. As it is probably of European origin, since it has long been known in France, factors for resistance are to be sought in European, not American, vine varieties. All exotic vines, including 'virgin' vines, appear to be susceptible. The outbreak in Champagne closely resembled that in several other localities; a first attack

confined to the areas infected in 1944 was followed by another affecting all the vineyards in the vicinity. Severe damage was caused to the young fruit clusters, some of which entirely failed to set, though no direct infection of the fruit was observed. Surveys in numerous vineyards showed that timely applications of copper sulphate had in every case afforded adequate protection. It appeared that when spraying was carried out a few days before the rain which effects the spread of the disease, the protection given was adequate, but if spraying was delayed it became useless. One application was of no value unless shortly preceding the period of contamination.

In conclusion, it is stated that spraying against *P. tracheiphila* must be practised preventively. When the meteorological data are insufficient to predict the date of an outbreak, the timing of the first spray application must take into account the likelihood of attack, depending on the formation of apothecia and the conditions governing spore formation. The number of treatments required and the dates on which they are to be given are governed by the rate of growth of the branches during the dangerous period.

Levadoux (L.). **La lutte contre le brenner.** [The control of 'brenner'.]—*Progr. agric. vitic.*, cxxvi, 46–47, pp. 309–311, 1946.

In spraying tests carried out in Champagne in 1946 against 'brenner' disease of the vine [*Pseudopeziza tracheiphila*: see preceding abstract] by Françot and Mauro, using 4·5 per cent. Bordeaux mixture, a vine sprayed on 24th April, 11th May, and 23rd May later had a disease rating of 0·23, the corresponding figure for one treated on 24th April and 11th May being 0·32, and for a third sprayed only on 24th April, 0·87, as against a rating of 1 for five control vines sprayed on 4th June.

In Switzerland, Gallay, Staehelin, and Wuergler obtained similar results, a plot sprayed with 2 per cent. Bordeaux mixture as from 25th April later having 12 leaves per vine attacked, one sprayed as from 18th May showing 40, and a third, sprayed from 31st May, having 58.

In those parts of France in which the vines were sprayed with Bordeaux mixture following official spray warnings the vines were only very slightly attacked, as in Burgundy (Côte d'Or) where losses from brenner were avoided by all growers who sprayed.

Levadoux (L). **Chronique du court-noué. II.** [Notes on court-noué. II.]—*Progr. agric. vitic.*, cxxvi, 48–49, pp. 341–342, 1946.

Referring to the view expressed by S. Pontailler (*J. France agric.*, 23rd November, 1946) that the virus nature of vine court-noué disease [*R.A.M.*, xxvi, p. 94 and next abstracts] has not been established and therefore the inspection and large-scale eradication called for by Branas are premature, the author points out that Branas's recommendations were made precisely because the disease is in fact transmissible by budding and grafting, because a soil in which affected vines have been grown continues to transmit the disease to newly planted vines for many years, and because the disease is still slowly spreading.

Branas (J.), Bernon (G.), & Levadoux (L.). **Nouvelles observations sur la transmission du court-noué de la Vigne.** [New observations on the transmission of court-noué of the Vine.]—*Progr. agric. vitic.*, cxxv, 1–2, pp. 20–25; 3–4, pp. 42–48; 5–6, pp. 82–83, 7 figs., 1946.

From vines affected with court-noué [*R.A.M.*, xxv, p. 491; xxvi, p. 94 and next abstracts] the authors isolated a fibre-like protein. All attempts to induce the disease by inoculation of healthy vines with crude juices from affected vines or with more or less purified extracts gave negative results. To investigate the part

played in transmission by *Phylloxera* [*vastatrix* f. *radicicola*] six pots of soil in which vines had not been grown for many years were planted on 3rd February, 1944, each with four Rupestris du Lot cuttings, previously disinfected. Pots 1, 5, and 6 were the controls, but 5 and 6 became contaminated with *Phylloxera*. Pot 2, on 3rd February, received pieces of affected root of 33 M. de G. vines, and pot 3 on 19th June received affected 3·905 C roots. On 25th August, pot 4 was given affected 404 C roots bearing living *Phylloxera*. On 30th July, 1945, the figures for court-noué assessed according to an arbitrary scale (0 unaffected to 5 markedly affected) for the six pots were, respectively, 1·5, 2, 2, 2·5, 3·5, and 2·5. From a further test in which affected pieces of roots were washed, brushed, and disinfected before insertion, it was apparent that when such disinfected roots were used the severity of the disease a year later was not greater than that of the control. All pots, however, were contaminated with *Phylloxera*.

A third experiment was carried out, in 1944, using soil from an affected area. Pots 11 and 17 were filled with non-contaminated soil (control), pot 12 with court-noué soil sieved and freed from root debris, pot 13 with clean soil plus 3 per cent. sieved 'affected' soil, pot 14 plus 45 per cent. sieved 'affected' soil, and pot 16 'affected' soil not sieved. In August, 1945, all had *Phylloxera*, 13 having the least, and the disease ratings were, respectively, 2·5, 2, 4, 2·5, 3·5, and 4. This result suggests that intensity of the disease is proportionate to the number of active vectors.

In a fourth experiment seedling Gamay plants, grown in clean soil, were transplanted at the time of inoculation to pots of similar soil. Pot 101 was inoculated with an egg of root-inhabiting *Phylloxera* from an affected plant; pot 102 inoculated with a Gamay root bearing 30 fixed insects of which some were young and active; pot 103 plus 7 root-inhabiting *Phylloxerae*; pot 105 plus 7 *Phylloxerae*, all active except one, from affected 17 C; pot 106 plus 40 *Phylloxerae*, in all states from the same source. On 30th July, 1945, no *Phylloxerae* could be seen in any of the pots; plant 101 showed no apparent court-noué, 102 showed a few old, dried-up [root] knots, 103, foliar distortion and numerous old root knots; 105, two distinctly variegated leaves and old knots, while 106 showed marked variegation on two leaves, and old, rotting knots. While these results do not prove that court-noué is transmitted by root-inhabiting *Phylloxera* none of the facts observed is against such an hypothesis.

In other inoculation experiments *Phylloxera* leaf galls from affected vines buried in the soil appeared to aggravate the disease (2·5 in control, 3·5 to 4·5 in the inoculated plants), particularly when the inoculations were made later in the season (September).

When seeds from a healthy Gamay vine were sown on 2nd February, 1944, in pots of earth taken at a depth of 30 cm. and 1 m., respectively, from a place where an affected vine had been dug up in 1938, and where lucerne had since been grown, two plants developed marked *Phylloxera* infestation, remained sickly, and showed variegation and foliar deformation.

As far as they go the results obtained are in conformity with the view that root- and gall-inhabiting *Phylloxerae* are both able to transmit court-noué, and that, with the former, the effect of inoculation appears to depend on the number of insects able actively to intervene.

Bellet (H.). **Le court-noué en Haute-Savoie.** [Court-noué in Haute-Savoie.]—*Progr. agric. vitic.*, cxxv, 9–10, pp. 163–164, 1946.

During the last three or four years the vineyard of Bas-Faucigny, Haute Savoie, situated at an altitude of 450 m. on the steep slopes beside the river Arve, has become affected by court-noué [see following abstract]. The stock is the Gringet or Savagnin variety, which is rather susceptible. The soil favours the presence of *Phylloxera* [*vastatrix* f. *radicicola*]. The outbreak appeared as a generalized

invasion, all the vines presenting much the same symptoms. Heavy rain in autumn causes soil to accumulate at the foot of the vines; this soil is later removed by the growers higher up the slope, only to be washed down again later on, with the result that the dispersal of the insects is probably facilitated.

Branas (J.). **La lutte contre les parasites en 1946.** [Control of parasites in 1946.]—*Progr. agric. vitic.*, cxxv, 16–17, pp. 254–258, 1946.

Since 1940, the control of vine diseases in France has been rendered difficult and ineffective as a result of a lack of fungicides. In most cases, however, the economic results have not been conspicuous. They were most marked in relation to *Oidium* [*Uncinula necator*: *R.A.M.*, xxvi, p. 4], disastrous outbreaks of which occurred in 1944 and 1945 on susceptible vines and in areas which, like the south of France, are climatically favourable to the disease. Mildew [*Plasmopara viticola*: ibid., xxv, p. 488] was slight or nil, but the latent threat of it was a constant source of anxiety. As a result of these circumstances a wider use was made of vine varieties more resistant to diseases than the ungrafted hybrids.

The need to economize in copper caused growers to postpone as long as possible the application of the first spray, which favoured the spread of diseases that develop early, i.e., black rot [*Guignardia bidwellii*: ibid., xxv, p. 489] and brenner [*Pseudopeziza tracheiphila*: see above, p. 225]. Black rot increased notably in Armagnac in 1942 and brenner in Champagne in 1945.

Garoglio (P. J.). **Nouvelles recherches sur les soufres dans la lutte anticryptogamique.** [New researches on sulphurs in the control of fungi.]—*Rev. Vitic., Paris*, xcii, 13, p. 393, 1946.

Referring to the economy that can be effected by dusting vines preventively with sulphur against *Plasmopara viticola* and *Uncinula necator*, the author mentions recent researches showing that the fungicidal effect is increased nearly threefold when yellow, refined, ground, and ventilated sulphur is activated by the addition of clay, carbonate of lime, or bentonite and given a dark pigmentation [*R.A.M.*, xxvi, pp. 5, 43].

In Italy, the best natural sulphur already exists in the colloidal state, mixed with clay, both in the Romagna and in Irpinia, crude sulphur from the latter locality having in the author's experiments always given excellent results. No burning was caused to the berries or leaves, adhesiveness was effective and in direct relation to efficacy and economy, and the dark pigmentation increased fungicidal activity. Crude forms of sulphur, ventilated and containing about 30 per cent. sulphur, can be recommended unreservedly.

Bernon (G.). **A propos de la lutte contre l'Oidium.** [On the control of *Oidium*.]—*Progr. agric. vitic.*, cxxii, 13–15, p. 117, 1945. [Abs. in *Ann. Épiphyt.*, N.S., xii, 1, p. 70, 1946.]

In the author's opinion, the best method of applying sulphur against vine *Oidium* [*Uncinula necator*: *R.A.M.*, xxv, pp. 489, 490; xxvi, pp. 4–6] is to make the first application, using wettable sulphur, when the last bud to develop is 5 cm. long; the second and third applications should be made with powdered sulphur. The wetters used in the manufacture of copper mixtures give excellent practical results with sulphur, provided an excessive quantity is not employed. The sulphur is used at a dosage of 4 per cent.

Bernon (G.). **Le mildiou en 1946.** [Mildew in 1946.]—*Progr. agric. vitic.*, cxxvi, 50–51, pp. 366–370, 1946.

During 1946, vine mildew [*Plasmopara viticola*] was less prevalent and intense in France than it was in 1932, a catastrophic year, although in 1946 from bud-break

to flowering all the conditions except one, a prevailing temperature two or three degrees too low (average for May, 16·95° C.) favoured a severe outbreak. In June, 1932, however, 141·9 mm. of rain fell, evenly distributed over the month, whereas the June rainfall in 1946 amounted to 16·6 mm., and occurred about the middle of the month. After flowering hot, dry weather supervened, with the result that spread was slight and the yield, on the whole, not much affected. Serious losses, where they occurred, were due to negligence.

Perotti (R.). **Note fitopatologiche per gli anni 1939–41.** [Phytopathological notes for the years 1939–41.]—*Ann. Fac. agr. Pisa*, N.S., v, pp. 117–135, 4 figs., 1 graph, 1942. [French, German, and English summaries. Received March, 1947.]

This report contains, *inter alia*, the following items of interest. During the period under review the most prevalent diseases of fruit-trees in the vicinity of Pisa were *Clasterosporium carpophilum* [*R.A.M.*, xxiii, p. 68] and *Phyllosticta persicae* [ibid., xix, p. 582] on peach leaves, root galls on the same host caused by *Bacterium tumefaciens*, and a peach wilt with the appearance of leptonecrosis [ibid., xxvi, p. 19]. Pears growing to windward of *Juniperus* were rather extensively attacked by rust (*Roestelia cancellata*) [*Gymnosporangium sabinae*: ibid., xix, pp. 134, 582; xx, p. 382]. Vines were affected sporadically by *Coniothyrium diplodiella* [ibid., xxiii, p. 206; xxv, p. 153], which appears to be spreading locally. Chestnut groves showed new foci of infection by ink disease [*Phytophthora cambivora*: ibid., xxv, pp. 153, 191]. A branch of maritime pine [*Pinus pinaster*] showed infection by *Cronartium asclepiadeum* [ibid., xxii, p. 468].

Twentieth Annual Report of the Department of Scientific and Industrial Research, New Zealand [1945–1946], 110 pp., 1946.

In this report [cf. *R.A.M.*, xxiv, p. 493] it is stated that Granny Smith apples from five orchards usually producing fruit particularly susceptible to superficial scald [ibid., xxii, p. 316; xxiii, p. 473; xxv, p. 507] were wrapped in oiled paper immediately after picking, subjected to seven different treatments (i.e., immediate storage at 32° F. after picking or storage after first holding for from one to six weeks at air temperature). In store, no superficial scald developed until mid-January, long after the optimum storage period had elapsed. But when samples were removed and kept at air temperature for seven days nearly 100 per cent. developed scald by November. The general commercial practice with Granny Smith is to allow 14 to 21 days to elapse before wrapping and storage. In previous experiments [loc. cit.] it was consistently noted that when Granny Smith apples were wrapped in oiled paper a few hours after picking, they remained free from scald in storage. It seems evident that the prevalence of scald in commercially stored fruit results from neglect of this practice.

By November, considerable damage was caused in storage by breakdown and core flush [ibid., xxiii, p. 473]. The best control resulted by delaying storage for six weeks, but this method cannot be recommended as it increased fungal attack and pit, and the fruit turned so yellow as to be unsaleable. Four years' experiments have shown that no advantage accrues from delayed storage of Granny Smith. Other storage experiments with Granny Smith showed that severe core flush developed in fruit from trees worked directly on to Northern Spy rootstock, but was greatly reduced in fruit from those with Reinette du Canada as intermediate.

In cold storage, Cox's Orange Pippin apples from trees given phosphate, nitrogen, and potash kept as well as fruit from the untreated controls. The former showed somewhat more internal breakdown, but less storage pit, and less superficial scald. Nitrogen applications heavily increased breakdown and fungal attack, but

somewhat reduced pit and scald. An experiment on date of picking gave rather different results from those of previous years; breakdown fell to a minimum and pit rose to a maximum in early March, at about the third and fourth weekly pickings. Ammonium sulphate again induced much more breakdown and fungal attack than dried blood. With Dunn's Favourite, the fruit from untreated trees showed much better keeping qualities than from those treated with nitrogen or phosphate, nitrogen, and potash. Nitrogen applications caused a marked rise in breakdown and superficial scald. Jonathan gave a heavy crop which kept very well in storage. Fruit from trees receiving 4 lb. (but not 2 lb.) ammonium sulphate in addition to a basic dressing throughout of phosphate and potash showed increased breakdown, fungal attack, and lenticel spot [ibid., xxi, p. 457; xxii, p. 468; xxiv, p. 92]. In Jonathans from trees given potash plus phosphate and nitrogen, breakdown was less than in those without potash. With Sturmer there was again a marked incidence of breakdown and fungal attack in fruit from trees given nitrogen only. When the nitrogen was balanced by phosphate or by phosphate and potash, storage quality equalled that of the controls.

In work by the Plant Diseases Division, Auckland, peach trees inoculated in 1941 with the crown-gall organism [*Bacterium tumefaciens*: cf. ibid., xxiv, p. 65] all developed typical galls, were stunted, grew poorly, and averaged two-thirds the weight of the controls. The citrus canker organism [*Xanthomonas citri*: ibid., xxiv, p. 493] was isolated from two citronelle trees growing on waste land near Kerikeri, and the disease was also found in two small, non-commercial orchards in Gate Pa district, Tauranga. *Verticillium dahliae* was isolated from wood of wilted apricot trees in various areas in Central Otago, all the affected trees growing on land previously planted with tomatoes. 'Green crinkle', not uncommon in apples and pears, and closely resembling 'false sting' [ibid., xxii, p. 438], was ascertained to be carried in the scion wood. *Glomerella cingulata* was isolated from fruits of *Acmena floribunda*, which indicates that this plant should no longer be used as a shelter-hedge round apple and pear orchards. Dithane and fermate (both at 2–100) gave encouraging results against black spot [scab: *Venturia inaequalis*: cf. ibid., xxiv, p. 63; xxvi, pp. 46, 63] on apples. Dithane was more effective than the standard lime-sulphur and colloidal sulphur sprays; it russeted the fruit, but not sufficiently to affect grading. Fermate gave control comparable with the standard sprays, but the residues were conspicuous and difficult to remove.

The report from the Cawthron Institute, Nelson [cf. ibid., xxv, p. 26], confirms the observations of the preceding year that Cox's Orange Pippin, Jonathan, and Sturmer apple-trees at Braeburn and Tasman given magnesium treatments in 1939–40 and 1940–41 are benefiting more from the ground dolomite than from the magnesium sulphate or magnesium carbonate [cf. ibid., xxv, p. 120]. Two 12-lb. applications have given slightly better and more lasting effects than one. The treatments, which have not been renewed, are becoming ineffective but in view of the severity of the magnesium deficiency on some of the trees at the start, the length of time over which the applications have sustained their effects is considered satisfactory.

A chlorosis of the young apical leaves of Delicious trees observed annually in parts of the Nelson District was severe in 1945 but the cause of the condition remains undetermined. Of fungi isolated from mature apple trees suffering from die-back associated with poor or injured roots, six occurred commonly, viz., *Valsa leucostoma*, *Diplodia* sp., and *Physalospora obtusa* (black rot) on the upper branches, and *Polystictus versicolor* (heart rot), *Stereum purpureum*, and black rot on the main limbs and trunk. The evidence suggested that soil factors and mechanical injury to the trees are the primary causes, *S. purpureum* and *P. versicolor* then making rapid headway and finally killing the trees. When dead leaves under Glou Morceau pear and Dougherty apple trees were sprayed with elgetol in early spring

shortly before spore discharge [by *Venturia pirina* and *V. inaequalis*], scab infection was delayed and its severity reduced [cf. ibid., xxv, p. 348].

Breeding for resistance to blind seed disease (*Phialea temulenta*) [ibid., xxv, p. 263] in rye grass [*Lolium* spp.] was continued by the Grasslands Division (p. 48). The disease threatens to ruin the rye grass seed trade in many parts of New Zealand, and appears to be spreading. Surveys of the disease at the Canterbury Agricultural College (p. 70) indicate that abnormal rainfall at sowing time is the most significant contributing factor.

Work by the Plant Diseases Division (pp. 51–53) confirmed the high resistance of the Sensation swede to turnip mosaic [cf. ibid., xxiv, p. 438; xxv, p. 54], and showed that the new variety, Dryland, is almost equally resistant. In further work on breeding garden pea varieties immune from pea mosaic [cf. ibid., xxiv, p. 132], of 18 hybrids tested only one was susceptible. An aphid-transmitted virus disease was found in tree tomato [*Cyphomandra betacea*]. The natural host range [in New Zealand] of spotted wilt [tomato spotted wilt virus] was extended by the inclusion of Calla lily [*Zantedeschia* sp.] and garden pea. A comprehensive investigation of the cause and control of yellow leaf of *Phormium tenax* [ibid., i, p. 295] was begun; that the symptoms were produced experimentally without the use of any pathogen suggests that the condition may be of physiological origin. Maize head smut [*Sphacelotheca reiliana*: cf. ibid., xxv, p. 364] was ascertained to be soil- and seed-borne. Four applications of Bordeaux mixture (3–4–50) at monthly intervals in winter almost completely controlled passion fruit grease spot (*Phytomonas passiflorae*) [ibid., xxiv, p. 459] and brown spot (*Alternaria passiflorae*) [ibid., xxi, p. 364]. Soil disinfection with formalin (1–50 to 1–80), paraformaldehyde (1–25 and 1–50), and chloropicrin gave good control of *Verticillium*, while D.D. was also satisfactory. During extensive investigations on methods of proofing canvas and other materials against fibre-destroying fungi [ibid., xxv, p. 176] it became apparent that it is necessary in this type of work to use several test organisms, since of the four selected, *Stachybotrys*, *Metarrhizium* [? *glutinosum*], *Chaetomium* [? *globosum*, ibid., xxv, p. 367, and below, p. 254], and *Memnoniella* [*echinata*: cf. ibid., xxiv, pp. 282, 380, 428], the first was more tolerant towards copper soaps, and the second was more tolerant towards pentachlorophenol, than the others. Of products tested for proofing rope and cordage against fungi, copper naphthenate (0·5 per cent. metal) was the most effective. Creosote-treated cordage showed a loss of 30 per cent. in tensile strength.

Co-operative work on tobacco research (pp. 57–59) by the Cawthron Institute and the Research Station was continued. A survey of plantations showed that the improvement in control of mosaic was being maintained [ibid., xxiv, pp. 6, 493], but high incidence occurs almost every year in several gardens.

In work at the Cawthron Institute (p. 66), steam treatment, chloropicrin, and 2 per cent. formalin all reduced tomato hard core [ibid., xxiv, pp. 6, 209], as did soil applications of cocoa-bean husks, sheep manure, and fertilizers, particularly potassic ones mixed with nitrogen. Incidence was highest on no-manure plots and those without potash.

Studies at the Canterbury Agricultural College showed that when Blue Prussian and William Massey peas were grown in unsterilized soil at 50, 70, and 90 per cent. moisture saturation capacity, one series at 56° to 116° F. and the other at 34° to 69°, seed treated (at 2 oz. per bush.) with agrosan, copper carbonate, spergon, and cuprous oxide germinated significantly better than undusted seed, cuprous oxide giving significantly the best result. No dust afforded the plants any protection from natural soil infection after emergence. Wound inoculations with *Botrytis cinerea* of Sweet Blue, Sweet Yellow, Sweet White, and Bitter Blue lupins growing in sterile soil in the glasshouse showed that all except Sweet Yellow were highly susceptible, repeated inoculations of the last-named failing to cause infection.

Phytophthora infestans caused severe losses of potatoes throughout South Island during the autumn of 1945, following an abnormally wet summer. A survey of a limited area including 60 separate potato crops showed that among maincrop varieties Dakota was the least affected by tuber decay; Arran Banner had up to 80 per cent. tuber loss. The heavier and damp loams were associated with more disease than sandy loams and it appears that soil moisture retention following initial saturation is a primary factor. Among the varieties Aucklander S. T., Arran Banner, and Dakota, infections were less severe when the crop followed lupins used as green manure, the favourable effect being attributed to the resultant open texture and quick drainage conferred, and most severe when potatoes were grown for the second time in succession.

An investigation is being undertaken into 'scab' of maturing wheat. Isolations of fungi from ears collected in the field have provided spore suspensions for glasshouse and field inoculations which have indicated that at least six distinct types of *Fusarium* can cause ear blight to the extent of producing complete sterility. For comparisons between ear-blight symptoms in the field and apparent frost injury, potted plants were transferred to a refrigerator at anther extrusion. Those maintained at 32° C. for seven hours showed no abnormality at maturity. Those kept at 30° for two hours showed 60 per cent. normal spikelets, the others having sterile or shrivelled grain. Two hours' exposure to 26° caused 80 per cent. of the spikelets to show frost injury, mostly complete sterility. Symptoms identical with those found in frosted fields were observed in the experimentally frosted ears. It appears that frost at flowering may possibly cause distinct 'ear blight' of a physiological type. There would seem to be little difficulty in distinguishing between ear blight due to frost and that supposedly due to fungal infection. The 'whitehead' condition, very common in 1945–6, is a phase of 'ear blight'. The 'straggle' phase of *Cercosporella* [? *herpotrichoides*: ibid., xxiv, p. 493] injury leading to 'whiteheads' was observed in three localities, in two of which the organism was isolated. 'Whitehead' associated with late attacks of *Ophiobolus graminis* affected several wheat crops very severely, and traces of the disease were widespread; it was prevalent in crops sown after grass [cf. ibid., xxiii, pp. 130, 338; xxiv, p. 180].

Field evidence suggested that wheat seedling root rots are of three types, lesions on the sub-crown internode due to *Rhizoctonia* [*Corticium*] *solani* and *Fusarium* spp., root-tip decay due to *O. graminis*, and seedling blight due to secondary infections by *F.* spp.

Annual Report, Cawthron Institute, Nelson, New Zealand, 1945–6.—39 pp. [1946].

This report [cf. *R.A.M.*, xxv, p. 26] contains, in addition to the records already reviewed [see preceding abstract], the following results of investigations in progress. Further glasshouse tests of different treatments on the increase of 'cloud' in Dreadnought tomato plants are reported in the section on tomato investigations (pp. 20–24) to have been inconclusive because of the low incidence (3·8 per cent. compared with 14·1 in 1944), attributed to the drier condition of the soil in the early part of the season. The results appear, however, to confirm those of previous years in regard to an increase of the trouble with heavy watering of the plants, steam treatment of the soil, and the use of fertilizers.

In experiments designed to test the effect of fertilizers and soil disinfection on the incidence of tobacco mosaic (pp. 27–28) it was found that steam, urea, chloropicrin, formalin, and D.D. treatments of the seedling beds reduced the initial amount of disease in the field in comparison with untreated seedlings. Considerable increase of mosaic in the field was associated with applications to the seedling beds composed of unsteamed soil of fertilizer in excess of 0·5 lb. per sq. yd. and with pricked-out seedlings in comparison with those sown direct in the bed.

In contrast to the preceding season, angular leaf spot (*Pseudomonas angulata*) was either completely absent or very slight throughout all the tobacco-growing districts, presumably owing to the drought which persisted through the latter half of January and the whole of February.

Rayner (R. W.) & Nattrass (R. M.). **Annual Reports of the Plant Physiologist and Pathologist (Coffee Services) and the Senior Plant Pathologist, 1945.**—*Rep. Dep. Agric. Kenya, 1945*, pp. 55–61, 85–90, 1946.

In this report [cf. *R.A.M.*, xix, pp. 71–76] it is stated that in April, 1945, severe shedding of coffee cherries in all stages of development was noted on the Mongalia estate, Mitubiri, Kenya. Cherries reaching maturity often contained blackened beans showing no external lesion and from which no organism could be isolated. The condition appeared to be of physiological origin, similar to, but much more severe than, the shedding of young coffee cherries prevalent in the Makuyu area. Both this latter type of shedding and the production of black beans are due to insufficiency of carbohydrates but developing earlier than that which induces overbearing die-back.

A new type of physiological die-back, found at the Mchana estate, Ruiru, started as a vein-crossing scorch in which eventually all the leaves of a branch became involved and the branch died back. Such branches occurred mainly in the outer and upper regions. The affected trees were mostly found in a large, elongated depression, the centre of which was 20 ft. below the lowest point on the periphery. Drought extending over a considerable period, associated with mineral deficiency, is thought to have caused the die-back.

A peculiar drooping of the leaves on multiple stem coffee at Gethumbwini Estate, Thika, not caused by wilt, was associated with very short internodes on the main stem. The droop was fairly general on old, rather isolated, multiple stem heads, and was absent when these were shaded from the afternoon sun. It is thought to be a peculiar growth form induced by abnormal exposure.

Further study of pyrethrum [*Chrysanthemum cinerariifolium*] wilt and crown rot supported the view that much of the trouble is due to drought, over-cropping, or faulty cultivation. The disease often appears to start from a snag of dead wood left on the split [plants]. Other factors conducive to the condition are waterlogging, bad planting, damage by implements, and localized unsuitability of the soil. Associated with the rot are two constantly recurring types of *Fusarium*, *Sclerotinia minor*, and, less often, *S. sclerotiorum*. When either surface-sterilized pyrethrum seed or splits were grown in a mixture of sterile soil and sclerotial material from a pure culture of *S. minor* no infection had appeared after four months, and the sclerotia showed no sign of renewed growth. When a lettuce leaf infected with *S. minor* was placed at the base of pyrethrum seedlings 12 to 15 cm. high, rapid infection occurred after the plants had been covered with a bell jar for two days, killing the apical leaves in two to three days; two months later, some of the infected plants recovered and put out fresh shoots. Partial recovery had been observed occasionally in the field. Young seedlings were readily infected by placing small pieces of a ten-day agar culture in the leaf axils. The following plants (in descending order of susceptibility) were infected by inoculation: lettuce, lemon fruits, carrot, and beetroot. The evidence indicated that some of the forms producing large sclerotia on pyrethrum in the field and attributed to *S. sclerotiorum* may belong to *S. minor*.

Phoma lingam, not before recorded from Kenya, caused heavy loss to *Brassica* spp. being grown under the Government seed-production scheme. A crown rot of lucerne was caused by a fungus resembling *Rosellinia necatrix* in the cultural characters of the mycelium. A canker disease of tea affecting large areas of the main branch system occurred in several blocks on a large estate. The condition

was associated with a species of *Pestalotia* other than *P. theae* and with a *Phomopsis*, inoculations with both of which gave negative results. Ingress appeared to have taken place through pruning wounds; heavy pruning, followed by sun scorch, is thought to have been the primary contributing factor. Piling up the prunings to protect the bushes from the sun prevented damage to blocks pruned later.

Potato blight (*Phytophthora infestans*) [ibid., xxi, p. 426; xxiv, p. 337] is now permanently established in East Africa. The disease has occurred every season since 1941 throughout Kenya. Two resistant native varieties are being multiplied for 'seed', and the resistant Skerry Blue variety from Uganda [ibid., xxv, p. 27] is also being multiplied and distributed. In breeding work against the disease, plants from true seed of *Solanum demissum* received from Professor Reddick of Cornell University were raised for testing with the local biotypes of the fungus. Tubers of these plants were dispatched to Uganda, the Belgian Congo, and remote parts of Kenya, and no reports of blight were received; laboratory tests confirmed the immunity. A collection of later hybrids, including the new Empire variety [ibid., xxv, p. 276], were received from the same source. As it is now admitted that potatoes suitable for growing in the tropics need not necessarily be produced there, these and other temperate varieties will be grown and further breeding discontinued. There appears to be no evidence so far that the blight biotypes present in Kenya differ from those found in the United Kingdom, in fact only two seem to be present. The local varieties known as Kinongo and Kerai have been identified as Northern Star.

Further study of potato virus diseases in Kenya showed that all viruses investigated are types that have also been found in the United Kingdom. All the chief symptoms are manifestations of leaf roll, X, and Y and their combinations, virus Y, apparently, being responsible for most of the severe virus symptoms found. There is no question of any general degeneration of stocks, though some have been in cultivation for many years. Freedom from virus infection of individual Kinongo plants may perhaps be due to occasional setting of fruits and the consequent production of virus-free seedlings not differing essentially from the variety.

Orian (G.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1945*, pp. 13–15, 1946.

In this report [cf. *R.A.M.*, xxv, pp. 204, 253] it is stated that red rot [*Physalospora tucumanensis*: ibid., xxv, p. 233; xxvi, p. 126] was again widespread on the sugar-cane variety M. 134/32 during 1945 in Mauritius. In a large proportion of the attacks, infection was not correlated with insect damage to the stem. These observations and the fact that disease was commonly observed to have progressed through several internodes from individual infection sites indicate that M. 134/32 has again shown higher susceptibility than before.

The investigations on bud rot of royal palm (*Roystonea regia*) due to *Xanthomonas vasculorum* [ibid., xxiv, p. 368] were concluded. The presence of the disease is shown by the slow drying-out of the leaves from the oldest inwards, but occasionally some green leaves are found near the middle of the crown when the youngest emerging leaf begins to dry out. In advanced cases, the terminal bud and growing point tissues collapse into a malodorous mass. The vascular bundles of the stem, leaf, sheaths, and leaf stalks when cut across exude yellow gum, cavities filled with which are often found in the tender tissues of the top. No case of recovery is known. The causal organism was reinoculated successfully into royal palm and cross-inoculated into the white palm (*Dictyosperma album*). A plot of *D. album* and *D. rubrum* laid out in 1937 showed in June, 1945, 19 of 26 of the former and 1 of 8 of the latter affected by leaf blight due to *X. vasculorum*. The disease had not previously been observed in the plot, which was bordered with the highly susceptible M. 55/1182 sugar-cane variety.

Owing to the presence elsewhere of a virus disease of sweet potato [cf. ibid., xxvi, p. 145], the importation of living parts of this plant is forbidden.

Steyaert (R. L.). **Plant protection in the Belgian Congo.**—*Sci. Mon., N.Y.*, lxiii, pp. 268–280, 7 figs., 1946.

In the part of this paper dealing with plant disease problems in the Belgian Congo the author states that efforts are being continued to select strains of cotton resistant to *Nematospora coryli* [*R.A.M.*, xxv, p. 28, 154] and *Ashbya* [*N.*] *gossypii* [ibid., xviii, p. 797]. Artificial inoculations have shown marked differences in the reactions of various strains on the bolls. Since *Fusarium vasinfectum* was found on cotton at Bambesa in 1937 [ibid., xxv, p. 28], many foci of infection have been discovered, chiefly in the eastern part of the Uele district, northern Sankuru, and western Ubangi; in most cases the primary infections have been traced to Wonder Dixie Triumph seeds imported from the United States. To retard spread, strict quarantine measures have been enforced on the propagation of seed within the Colony. Selection for resistance, begun in 1939, is progressing satisfactorily. A crystalline product was isolated from the fungus, which reproduced the symptoms of the disease. Wilt is a serious threat locally, as most of the soils are of light texture and have a pH under 7. In addition, climatic conditions and soil temperatures near or within the optimum for the growth of the fungus are present throughout the year.

The chief disease of oil palm is caused by *Ganoderma lucidum* [cf. ibid., xvii, p. 314], which attacks the roots and trunk. Spike diseases (*Fusarium* spp. and *Pestalotia* spp.) are common and some are of major importance. *Armillaria mellea* was recorded on the roots and trunks recently, while deficiency diseases, indicated by leaf chlorosis, require much attention.

The new plantations of *Hevea* rubber show an alarming incidence of root rots, of which the chief is *Fomes lignosus* [ibid., xxv, p. 358], the African strain of which appears to be much more virulent than any of the Asiatic strains, its pathogenicity also being enhanced by the favourable environmental conditions.

Attempts to control the robusta coffee pest *Stephanoderes hampei* by spraying with spore suspensions of *Beauveria bassiana* [ibid., x, p. 188] (natural infections with which considerably reduce the insect population) gave inadequate results. The fungus is highly virulent to insects feeding on unripe coffee berries, especially during the cloudy weather prevailing north of the equator in June and July. Infection usually develops after the insect has bored a gallery to the middle of the berry. It then stops feeding, and crawls backwards until its abdomen protrudes, when there develops from it a puff of white mycelium bearing thousands of spores scarcely 3μ in diameter.

On the whole, coffee is little affected by fungal diseases in the Belgian Congo, though white root rot [*F. lignosus*: ibid., xix, p. 329] is sometimes troublesome in places. Round Lake Tumba coffee roots are often attacked by *Pseudococcus citri*. The insect does not appear to be dangerous unless *Polyporus coffeae* [cf. ibid., xxi, p. 287] develops on the exudate, when the insect lives in cells made of the mycelium. The fungus forms a brown sheath round the roots, but can be killed off by exposing the infected roots to the sun for five days. *Hemileia* rust [*H. vastatrix*: ibid., xxiv, p. 8] is virtually non-existent on robusta coffee, and when present is more an indication of an unhealthy condition of the trees than of true parasitism. Cacao root rot due to *Armillaria* [*mellea*: ibid., xiv, p. 87; xv, p. 16] is important, the fungus causing the well-known collar-crack.

By the end of 1942, potato blight (*Phytophthora infestans*) [ibid., xxii, p. 325] had gained a foothold in the Belgian Congo. In 1943, it extended its ravage over the whole of Ruanda–Urundi, Kivu, and Ituri, and spread, with disastrous results, to

the native-grown crops, which had become widely cultivated. It is estimated that in 1943, 200,000 tons of the potato crop were lost in Ruanda–Urundi alone. As the conditions in tropical highlands strongly favour infection, the disease is very difficult to control. Spraying is only of limited application on native farms, and the only means of control appears to be the use of resistant varieties [see above, p. 234].

The chief maize diseases are streak [loc. cit.], which occurs in the highlands, and *Sclerospora maydis* [loc. cit.], which is found in the lowlands. The latter has recently been prevalent in the Sankuru area, and selection work for resistance is in progress.

Wheat is grown only in the highlands, and is everywhere affected by *Puccinia graminis* though the barberry does not grow in Africa. Two crops are grown every year and stubble and ratoons carry the disease over from one crop to the next. Seed of resistant varieties has been imported from East and South Africa for breeding purposes.

Rice, cultivated in the hotter parts of the Belgian Congo, is sometimes attacked by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*].

Groundnuts, cultivated more as a delicacy than as a staple food, are sometimes badly attacked by rosette [loc. cit.]. The only cassava disease of economic importance is mosaic [ibid., xvii, p. 791], transmitted by *Bemisia gossypiperda* var. *mosaicivecta* [ibid., xviii, p. 231]. Among the many cassava varieties grown locally, it should be possible to find resistant ones. Sweet potatoes were found to be affected by a sort of rosette disease in the Ituri in 1939, the condition being suspected to be due to a virus [cf. ibid., xxv, pp. 28, 154, and preceding abstract].

Boughey (A. S.). **A preliminary list of plant diseases in the Anglo-Egyptian Sudan.** —*Mycol. Pap. Imp. Mycol. Inst.* 14, 16 pp., 1 map, 1946. 3*s.* net.

This preliminary list of diseases of economic plants in the Anglo-Egyptian Sudan [*R.A.M.*, xxii, p. 11] is compiled from the records of the Department of Agriculture and Forests and from various published works. The hosts are arranged alphabetically under their English names, the diseases of each being listed with English names and Latin binomials. That the list may have additional ecological value the regional distribution of diseases has been shown by dividing the Sudan into its former 15 provinces. Each district represents a fairly uniform combination of climatic and edaphic factors. The presence and frequency or the absence (if the host is present but the disease is not) of a disease in a given district is indicated.

Verona (O.). **Nutrizione e virulenza in 'Bac. tumefaciens'.** [Nutrition and virulence in *Bacterium tumefaciens*.]—Reprinted from *Riv. Pat. veg.*, xxxii, 9–10, 7 pp., 1942. [Received March, 1947.]

Continuing his researches on *Bacterium tumefaciens* [cf. *R.A.M.*, xviii, p. 729 and next abstracts] the author used a strain which had been grown on agarized meat broth (1·5 per cent.) for culturing on each of the following media, transferring each six times at intervals of a fortnight: (1) Berthelot's medium [ibid., ix, p. 767], (2) agarized meat broth (1·5 per cent.), (3) peptone agar (1·5 per cent.), (4) asparagin agar (1–1·5), (5) peptone-glucose agar (15–2–1·5), (6) glucose agar (2–1·5), (7) glycerine agar (2–1·5), and (8) starch agar (2–1·5). After the sixth transfer growth on these media was, respectively, very abundant, very abundant, abundant, very sparse (lost at the third transfer), good, very sparse, rather sparse, and very sparse. In addition, there were also differences in the morphological characters of the colonies on the different media; the organisms were less mobile on some than on others and were irregular also in size and shape.

All the strains (except that grown on substrate 4) were used to inoculate *Ricinus* [*communis*] seedlings in pots. The average dry ash weights of the resulting tumours induced by the seven strains used were, respectively, 0·1656, 0·1053, 0·0358, 0·0559, 0·0252, 0·0435, and 0·221 gm. The smooth colonies were again found to be more virulent than the rough [ibid., xxv, p. 546].

Verona (O.). **Azione repressiva sullo sviluppo dei tumori dovuti a Bact. tumefaciens dallo zolfo somministrato al terreno.** [The repressive effect on the development of tumours due to *Bacterium tumefaciens* of sulphur applied to the soil.]—Reprinted from *Ann. Fac. agr. Pisa*, N.S., vi, 7 pp., 1 pl., 1945. [Received March, 1947.]

When *Ricinus* [*communis*] plants, 20 cm. high, grown in boxes of sand or garden soil, to some of which powdered sulphur had been added at the rate of 1 or 2 gm. per kg., were inoculated with a young virulent culture of *Bacterium tumefaciens* [see preceding and next abstracts] (all the inoculations being successful), the resultant galls, at the seeding stage, were conspicuously smaller on the plants grown in the sulphur-treated soil or sand than on the others. The effect was most marked on the plants in soil plus sulphur. As it was thought that this retardation might be associated with change of the sulphur into sulphates in the soil a further experiment was carried out. To nine pots each containing 2 kg. sand, one being left untreated, additions were made, respectively, of calcium sulphate, potassium sulphate, sodium sulphate, magnesium sulphate (each of the foregoing with addition of ammonium nitrate), calcium nitrate, potassium nitrate, sodium nitrate, and magnesium nitrate. In each of the sulphate pots the quantity of sulphur present amounted to 0·32 gm., while the nitrogen content equalled that in the nitrate pots; in the latter series the weights of the metals present corresponded to those of the sulphate series. Except for the calcium sulphate, the salts were dissolved in 120 c.c. distilled water and added at the rate of 40 c.c. per day from the tenth day after sowing [*Ricinus*]. The plants were then inoculated. All the inoculations produced infection and in 12 to 15 days differences in the sizes of the galls became noticeable. An additional single application of the salts was then made in the same quantity as before. On the 45th day the galls were removed and the dry weights averaged, respectively, for the nine pots, 0·492 (control), 0·335, 0·422, 0·225, 0·43, 0·438, 0·43, 0·58, and 0·417 gm., the corresponding figures for sulphur as a percentage of the dry weight being a trace, 0·192, 0·148, 0·151, 0·143, and for the last four 0·039. These figures clearly show that the sulphates had a markedly repressive effect on the growth of the galls, and that this effect was specifically associated with the sulphate ion, which had been absorbed, and not with the cation [cf. preceding and next abstracts].

Florenzano (G.). **Effect of nitrogenous fertilizers on galls caused on Castor-Oil plants by Bacterium tumefaciens.**—*Int. Bull. Pl. Prot.*, xx, 11–12, pp. 97 M–101 M, 3 figs., 1946.

Continuing the researches initiated by Verona on the relation of mineral salts to the development of crown-gall (*Bacterium tumefaciens*) tumours in castor oil (*Ricinus communis*) plants [see preceding abstracts], the writer in 1942 and 1944 added to pots of (*a*) sandy, (*b*) clay soil, and (*c*) mould, (1) decomposed manure (600 quintals [1 quintal = 100 kg.] per ha.), (2) potassium nitrate (2 qls.), calcium cyanamide (4 qls.), and ammonium sulphate (6 qls.). The galls were uniformly larger on the plants in the sandy soil than on those grown in mould or clay. The effects of the fertilizers on the size of the excrescences varied with the soil type: in mould their action was definitely unfavourable, while in sand and clay they slightly reduced the extent of the tumours as compared with the controls receiving no amendments, except for calcium cyanamide, which increased gall diameter.

Gautheret (R. J.). **Comparaison entre l'action de l'acide indole-acétique et celle du Phytomonas tumefaciens sur la croissance des tissus végétaux.** [Comparison between the action of indole-acetic acid and that of *Phytomonas tumefaciens* on the growth of plant tissues.]—*C.R. Soc. Biol., Paris*, cxl, 5–6, pp. 169–171, 1946.

The author showed in previous experiments (*Bull. Soc. Chim. biol.*, xxiv, p. 13, 1942) that carrot tissues grown in a medium containing 0·1 mg. indole-acetic acid [cf. *R.A.M.*, xix, p. 467] per l. gradually lost their sensitivity to heteroauxin, and further (Une voie nouvelle en biologie végétale: la culture des tissus. Gallimard, Paris, 1945) that the periphery, and sometimes the entire mass of such colonies was composed of minute, quasi-discrete nodules in contrast to the normally smooth surface. An anatomical study of the tissues in question revealed a parenchymatous mass with only a few scattered cribrovascular elements of anomalous appearance. Other accompaniments of acclimatization to heteroauxin were a loss of the rhizogenous capacity of normal tissue and a faculty for rapid proliferation persisting even in the absence of indole-acetic acid from the medium.

Attention is drawn to the analogies between these features and those observed by White and Braun in their culture of sunflower crown-gall (*Phytomonas* [*Bacterium*] *tumefaciens*) tissues [*R.A.M.*, xxi, p. 6].

Hildebrandt (A. C.), Riker (A. J.), & Duggar (B. M.). **Influence of crown-gall bacterial products, crown-gall tissue extracts, and yeast extract on growth in vitro of excised Tobacco and Sunflower tissue.**—*Cancer Res.*, vi, 7, pp. 368–377, 2 graphs, 1946.

In studies at the University of Wisconsin on the effect of certain crown-gall (*Phytomonas* [*Bacterium*] *tumefaciens*) metabolites and tissue extracts and yeast extract on the growth *in vitro* of the callus tissues of Giant Russian sunflower and tobacco (*Nicotiana glauca*×*N. langsdorffii*) fermented, bacteria-free media from virulent and attenuated cultures of the pathogen added to the basic medium exerted a strongly inhibitory effect at the higher concentrations of 2, 4, and 8 ml. per 50 ml. Lyophilized virulent and attenuated bacterial cells were also generally injurious to the development of both tissues at concentrations of 0·012 to 0·2 gm. per 50 ml. The addition to the basic medium of autoclaved marigold [*Tagetes* (?) *patula*: cf. *R.A.M.*, xxi, p. 247] crown-gall tissue extract, of unautoclaved tomato gall extract, and of unautoclaved brewer's yeast extract usually stimulated the growth of the excised tobacco and sunflower tissues at lower concentrations in a range from 0·125 to 8 ml. per 50 ml. but inhibited it at higher ones. Autoclaved Paris daisy [*Chrysanthemum frutescens*] crown-gall tissue extract at all concentrations promoted the growth of sunflower tissue, but tended to depress that of tobacco at the higher dosages.

Krythe (J. M.) & Wellensiek (S. J.). **Five years of colchicine research.**—*Bibliogr. genet.*, xiv, 1, pp. 1–132, 1942. [Received April, 1946.]

An attempt has been made to summarize the recent literature on colchicin, with special reference to the induction of polyploidy in plants, e.g., in the case of crown gall (*Bacterium tumefaciens*) tumours [*R.A.M.*, xxi, p. 247]. The bibliography comprises 385 titles.

Stahel (G.). **Cacao.**—*Meded. Dep. LandbProefsta. Suriname*, 10, 32 pp., 1947. [Dutch.]

The section of this bulletin dealing with cacao diseases and pests in Surinam contains notes on witches' broom [*Marasmius perniciosus*: *R.A.M.*, xiv, p. 430] and stem canker and fruit rot [*Phytophthora palmivora*: ibid., viii, p. 527]. The most profitable method of combating the former is the removal and destruction of

the brooms at least four times a year, while the stem cankers should be excised and the wound treated with a disinfectant. Spraying the fruits with Bordeaux mixture is effective but too costly for the small grower.

CHESTER (K. S.). **The nature and prevention of the cereal rusts as exemplified in the leaf rust of Wheat.**—xvi+269 pp., 1 fig., 2 diags., 8 graphs, 1 map, Chronica Botanica Company, Waltham, Mass., 1946. $5·00.

This important book deals primarily with leaf [brown] rust of wheat, *Puccinia triticina*. It gives an extensive synopsis of the literature, which is particularly useful because the Russian papers have been read in the original (full translations of most of them have been made and deposited in three libraries in the United States and one in Canada).

The 15 chapters deal with the history of the disease; the origin, distribution, and economic importance; effect on the host; suscepts; symptomatology; etiology; physiologic specialization (two chapters); factors affecting rust survival and development (two chapters); dissemination, annual cycles, and epiphytotics; natural, regulatory, and cultural rust control; rust control by the use of fungicides; and control by rust resistance (two chapters). The bibliography includes nearly 500 titles, and is followed by an author index and a full general index.

The only alternate host of *P. triticina* found infected naturally is *Isopyrum fumarioides*, a perennial weed which is very commonly heavily infected in the Lake Baikal region of the U.S.S.R. This suggests that central Asia is the point of origin of the rust. The writer prefers the generally used narrow concept of *P. triticina* rather than that which places the rust as a form of *P. rubigo-vera* or of *P. elymi*.

Most or all of the 129 'registered' physiologic races can, it is thought, be placed in eleven 'race-groups'. The whole field of physiologic specialization in *P. triticina* is considered comprehensively, as are the other phases of the subject. The book is clearly and readably written, and will be of value to all plant pathologists.

MILNER (M.), CHRISTENSEN (C. M.), & GEDDES (W. F.). **Grain storage studies. V. Chemical and microbiological studies on 'sick' Wheat.**—*Cereal Chem.*, xxiv, 1, pp. 23–38, 3 figs., 1947.

'Sick' or germ-damaged wheat samples from Montana, North and South Dakota, and Minnesota showed 76 per cent. mould infection and very low germination values (1·4 per cent. average of 12, compared with 86·7 for sound material) on examination at the Minnesota State Seed Testing Laboratory. The most prevalent mould on the 'sick' seeds was *Aspergillus glaucus* (60 per cent.), followed by *Penicillium* sp. (20 per cent.), the remaining 20 per cent. being composed of *A. niger*, *A. flavus*, *A. candidus*, *Nigrospora*, *Rhizopus*, and *Trichoderma* spp., and several unidentified bacteria [*R.A.M.*, xvi, p. 664; cf. also xxii, p. 350]. The sound samples from the same lots were largely contaminated by *Alternaria* sp. (90 per cent.), which disappeared in storage under moisture conditions favouring the growth of species of *Aspergillus*. *Fusarium* and *Helminthosporium* spp. were present to the extent of 5 per cent. each.

Surface-disinfected, relatively mould-free Montana wheat, inoculated with various moulds isolated from 'sick' seeds and stored in air, lost viability more rapidly than did the controls, and most of the non-viable seeds showed the dark germ typical of the condition. For instance, after 38 days the percentage of germination among the controls and inoculated seed ranged from 90 to 93 and 34 to 74 per cent., respectively, the corresponding figures at the end of 111 days being 49 to 67 and 14 to 35, respectively. Moulds were present on the controls before the completion of the test, and none of the samples germinated after 201 days.

'Sick' wheat was produced in the laboratory by storing samples of the Regent variety at 18 per cent. water content under atmospheres of carbon dioxide, nitrogen,

or oxygen in sealed containers. Only under oxygen did moulds, principally *Aspergillus glaucus* and *A. candidus*, proliferate throughout the test period of six months, whereas 'sick' kernels appeared under all atmospheres. Fat acidity increased in all samples at 18 per cent. moisture, reaching a maximum in the oxygen series. The 'sickness', therefore, could not be attributed exclusively to moulds, but was enhanced by their metabolic activity. Aerobic and anaerobic production of carbon dioxide by moulds and seeds under the experimental conditions necessitated monthly renewals of the oxygen and nitrogen atmospheres. Fat acidity of mill fractions of sound wheat was at a maximum in the bran fraction, decreasing regularly towards the patent flour, whereas in the 'sick' material the low-grade flour showed the highest fat acidity. These effects are apparently due to the high lipase activity of the aleurone layer and scutellum in relation to that of the germ.

Klykov (A. P.). О сохранении жизнеспособности возбудителя черногобактериоза в семенах пшеницы. [The viability of the causal agent of black bacteriosis in Wheat seed.]—*Микробиология* [*Microbiology*], xiv, 6, pp. 413–414, 1945. [Received April, 1946.]

In these experiments to test the viability of the causal organism of black bacteriosis (*Bacterium* [*Xanthomonas*] *translucens*) in wheat, seed of 10 varieties was washed in running water and then disinfected with mercuric chloride to eliminate external infection. Portions of 1 gm. of the disinfected seed were ground with sterile water in a mortar and the resultant suspensions, when sown on agar, produced colonies which showed that each gm. of grain of one variety had 12,620,000 bacteria present at the start of the experiment, 870,000 at the end of six months, and only 1,000 by the end of three years. Another variety, which carried 760,000 bacteria to begin with, falling to 181,000 in six months, still carried 4,000 at the end of three years; while in six other varieties infection varying initially from 3,240,000 to 760,000 per gm. dropped to nil by the end of the three-year period.

Åkerman (Å.). **Nya iakttagelser rörande olika Havresorters motståndskraft mot gråfläcksjuka.** [New observations relating to the resistance of different Oat varieties to grey speck disease.]—*Sverig. Utsädesfören Tidskr.*, lvi, 2, pp. 159–172, 1 fig., 1946. [English summary.]

In the light of the cumulative data obtained in trials on the reactions of a number of oat varieties to grey speck [manganese deficiency], which have been carried on intermittently at the Swedish Seed Association Station since 1921 [*R.A.M.*, i, p. 417; xii, p. 19], the following approximate grouping is proposed: I a (very susceptible): Förädlad Dala, certain selections of *Avena orientalis*, Vit Odal, and v. Lochows Gelbhafer; I b (fairly susceptible): Guldregn I, Örn, Bambu, Seger, Orion I, Eko, Gul Naesgaards, Primus, Sol I, Guldregn II, Thors, and Ligowo II; II a (fairly resistant): Engelbrekt II, Gopher, Argus, Engelbrekt I, Klock II, Klock III, Stjärn, Diamant, Sølv, Orion II, Perle, Melöj III, Extra Klock, Stormogul I, Stormogul II, Sirius, and Klock I; II b (very resistant): Mesdog, Moss, Fyris, and *A. strigosa* [cf. ibid., xxvi, p. 195]. It would appear from these observations that the Swedish white oats are generally more susceptible to the disease than the black types from the central and northern regions, while continuous selection seems almost invariably to have led to enhanced resistance.

Wide discrepancies in segregation among the progeny of crosses have been recorded, involving transgressions both in susceptibility and resistance to manganese deficiency. It is concluded that breeding for resistance is feasible, but owing to the complex nature of the mode of inheritance a lengthy period is likely to be required for the development of varieties adapted to the varying local requirements of the country. In the meantime steps should be taken to combat the trouble by soil amendments with manganese sulphate [ibid., xxiv, p. 431].

Josephson (L. M.) & Johnson (E. M.). **Crazy top of Corn in Kentucky.**—*Plant Dis. Reptr*, xxxi, 2, pp. 69–70, 1947. [Mimeographed.]

During 1946, U.S. 13 hybrid maize in Greenup County, Kentucky, developed a striking abnormality similar to crazy top [*R.A.M.*, xxv, 556]. In most cases the floral organs became entirely replaced by vegetative shoots, a large, bunchy vegetative growth appearing instead of the tassel, with twisting and curling of the leaves immediately below. On these plants ear primordia were lacking but on some plants there were a few normal male florets. Sometimes there was much branching from the leafy proliferations of the tassel with vegetative shoots developing at the terminal ends of these branches which were entirely of leaf tissue. One plant was discovered with a normal ear and tassel; except that a large, bunchy, vegetative growth had developed from one sprig of the tassel. Several plants showed ears consisting entirely of leaf tissue and male florets; some produced apparently viable pollen. Others showed excessive jointing on the upper half of the stalk with no bunch at the top. A few were not over 2 ft. tall and were excessively branched. Leafy shoots of the witches' broom type arose from the terminal meristems of the branches and floral organs.

While the cause of the condition has not yet been ascertained, the witches' broom type of growth suggests a virus origin. The field was subject to flooding, but no definite connexion between this and the disease has so far been traced.

Haas (A. R. C.) & Zentmyer (G. A.). **Treatments for chlorosis in Lemon leaves.**—*Calif. Citrogr.*, xxxii, 2, pp. 48–49, 64–65, 8 figs., 1946.

In further studies on the effects of various iron compounds on the control of chlorosis in lemon leaves [cf. *R.A.M.*, xxvi, p. 102] carried out at the Citrus Experiment Station, Riverside, California, treatments were given in July, and the shoots examined on 30th August, 1946. A dust treatment with 8 gm. fermate, 8 gm. magnetite, 1 gm. ferrous sulphate, 1 gm. sulphur plus 1 gm. dextrin resulted in the leaves becoming fully green. A dusting (on 1st May), using 4 gm. magnetite, 1 gm. sulphur, caused a considerable though gradual improvement. Leaf dips, using 1 gm. iron sulphate in 1 l. distilled water, or the following combinations: 1 gm. iron sulphate, 0·25 gm. dextrin, 5 c.c. glycerine; 1·2 gm. iron sulphate, 1·2 gm. dextrin, 1·2 gm. sulphur; 1 gm. iron sulphate, 0·25 gm. sulphur, 5 gm. molasses; or 0·25 gm. iron citrate, 0·25 gm. sulphur, 0·25 gm. dextrin, 1 c.c. glycerine, all with blood albumen spreader in 1 l. distilled water, all gave good colour improvement.

A progress report on quick decline studies.—*Calif. Citrogr.*, xxxi, 6, pp. 198–199, 207, 210–215, 1 fig., 1946.

In this account of the investigations into quick decline of orange trees [*R.A.M.*, xxv, p. 498] H. S. Fawcett points out that agencies other than that producing quick decline may cause loss of starch in roots and that care is necessary to eliminate the possibility of such factors before attributing the starch loss to quick decline.

H. Schneider's histological investigations revealed a collapse of the sieve-tubes in the region of the bud union in trees known to be in the early stages of quick decline. In the later stages a gradual degeneration of the tubes in the outer portion of the functioning phloem spread as far as 18 in. above and below the union, accompanied by considerable necrosis at the union at all stages. It is suggested that a substance passes from the leaves to the roots. The general result is to leave the roots defenceless against fungal and bacterial attack. These histological symptoms are said to resemble closely those caused by Green Valley buckskin [peach X-disease] virus infection of *Prunus avium* on Mahaleb (*P. mahaleb*) roots [ibid., xxv, p. 37].

Two common species of brown-rot fungi [*Phytophthora citrophthora* and *P. parasitica*] were frequently isolated from rotting roots by L. J. Klotz and G. A. Zentmyer. *Fusarium* sp. and *Pythium ultimum* were present also, and many species of bacteria. The two brown-rot fungi were found capable of destroying feeder roots at various temperatures between 50° and 86° F. and at a moisture content of field capacity, root destruction being higher in colder, wetter soils. Citrus seedlings grown in vaporized nutrient in 10-l. glass jars and thus kept thoroughly wet and aerated were also quickly destroyed, a result suggesting that in the orchard lethal fungal attack of the roots might follow waterlogging, as better aeration was established. Inoculations of the roots of apparently healthy trees in quick-decline groves with the various fungi isolated suggests that their pathogenicity in these circumstances is unimportant.

Iron sulphate and fuller's earth alone among many soil treatments applied stimulated root growth in affected trees. Hormone treatment of the rootstocks and trunks of some of the experimental trees produced in several cases a definite, if temporary, improvement.

J. M. Wallace and G. A. Zentmyer found that cut roots with little or no starch content rotted easily, whereas those which had reached the equilibrium stage and had replenished their starch did not decay when cut.

Fawcett (H. S.) & Wallace (J. M.). **Evidence of the virus nature of Citrus quick decline.**—*Calif. Citrogr.*, xxxii, 2, pp. 50, 88–89, 1 fig., 1946.

Near Covina, California, in April, 1945, several one-year-old Valencia orange trees on sour orange stocks were planted and in June buds from old Valencia trees suffering from quick decline [see preceding abstract] were placed in 100 of these healthy trees. Similar 'spur' buds from healthy Valencia trees growing outside the quick decline area at Riverside were placed in 50 of the young Valencia trees at Covina, 50 similar trees being left unbudded. Of the old infected Valencia trees 45 per cent. showed symptoms of quick decline in May, 1945. In August, 1945, it was found that approximately the same number of buds from healthy as from affected trees became well-established in the young trees. During September, 1946, some of the young trees began to show top symptoms suggesting quick decline and these also had low starch content in the roots. By November, 1946, of those grafted with affected buds 36 had contracted the disease as against one of those budded with healthy buds and one amongst the 50 not budded.

Bartholomew (E. T.) & Sinclair (W. B.). **Bud selection and granulation.**—*Calif. Citrogr.*, xxxii, 3, pp. 94–106, 123–4, 1 fig., 1947.

Granulation [*R.A.M.*, xxiv, p. 97] is of commercial importance only in the Valencia orange in California. It can only be located by cutting the fruit, as it is a disorder of the juice sacs where chemical changes result in the formation of more inorganic matter and less sugar and carotin than in healthy sacs, thus adversely affecting the flavour. It occurs most commonly on young trees, particularly in the latter half of the picking season, and in the largest fruits; the trees tend to behave consistently from year to year. It is increased by low temperatures, excessive irrigation, and conditions favouring rapid tree growth, so that fertilizers may cause an increase. Irregularity of occurrence indicates that granulation is affected by many factors. As a method of control, lime spraying has proved effective, but this method results in premature loss of leaves.

An attempt was made by the authors to secure control by selection of buds and rootstocks. Buds were selected from four trees at Santa Ana and two at Riverside. Three of the trees had a history of heavy granulation, and three of little. Buds from each tree were set in equal numbers on sweet and sour orange stocks. The resulting 140 trees were grown together and subjected to the usual grove treatment.

The results show that in most cases the origins of buds and stocks made little difference to the percentage granulation, which averaged for the five years, 1941–6, 26 to 28 per cent. at Santa Ana. At Riverside, however, trees originating from buds of a heavily affected tree produced an average of 47, and those from buds of a slightly affected tree 21 per cent. granulated fruit. This irregularity seems to indicate that selection of suitable buds and rootstocks would be merely casual. The age, growth rate, part of tree, rootstock, seasonal variations, and geographical position all affect granulation. Buds from the same parent tree grafted on to similar stocks showed more granulation when grown in the coastal area than in the interior.

Guillemat (J.). **Quelques observations sur la trachéomycose du 'Coffea excelsa'.** [Some observations on tracheomycosis of *Coffea excelsa*.]—*Rev. Bot. appl.*, xxvi, 287–288, pp. 542–550, 4 figs., 1946.

During 1937–8, *Coffea excelsa* trees cultivated in the Ubangi area of French Equatorial Africa developed a disease which killed off a few trees aged six to eight years, but which rapidly grew worse, until, up to the present, over 10,000 ha. of these trees have been decimated by the condition. Wild *C. excelsa* trees growing in the neighbouring forests are unaffected. The terminal leaves become crinkled and yellow, dry up, then turn brown, and fall off in a few days. This process, at first confined to one side of the tree, spreads all round. The coffee 'cherries' on the leafless branches turn yellow, blacken, and dry up. Finally nothing remains but a bare tree, the tissues of which dry up in a few days. Sometimes one tree is found to be affected among a number of healthy ones, while some distance away four or five trees together may be killed. No foot rot was present. When sections were made of a branch, trunk, or root of an affected tree, the last annual rings showed brownish, confluent areas, which were most conspicuous on the side of the tree where the disease started. Microscopic examination showed a tracheomycosis, the wood vessels containing hyphae 4 to 5 μ in diameter with septa 10 to 15 μ apart, and sometimes hyaline, oboval chlamydospores rather wider than the hyphae. The surrounding cells blocked the vessels with tyloses.

The fungus was also isolated by Steyaert, who named it *Fusarium xylarioides* [? n. sp., without a Latin diagnosis] on account of the peculiar form of the sclerotioid masses which develop in culture in one to three months. The slightly curved or straight macroconidia are 2- to 3-septate, and measure 20 to 25 by 4 to 5 μ. It is hoped to undertake further study of the fungus.

Tests with various fungicides showed that the fungus was susceptible to copper sulphate. Further work in this direction is indicated. Meantime *C. excelsa* is no longer cultivated locally. Work on the selection of resistant strains of *C. excelsa* has begun.

In a foreword to this paper, A. Chevalier expresses the view that the affected trees are, perhaps, growing under unfavourable conditions, and may need organic and mineral fertilizers. Shade should be provided and excess soil acidity remedied [cf. *R.A.M.*, xxi, p. 408].

Progress Reports from Experiment Stations, season 1944–45.—142 pp., 4 graphs, 1 map, London, Empire Cotton Growing Corporation, 1946.

These reports contain, *inter alia*, the following items of interest [cf. *R.A.M.*, xxiv, p. 448]. Manurial experiments at the Barberton Cotton Experiment Station, South Africa, showed that leaf fall of U. 4/5143 cotton plants, associated with *Alternaria* attack, was sufficiently delayed by applications of potash to have a marked beneficial effect on final yield.

In Southern Rhodesia observations at the height of the growth season showed that groups of plants in a few related cotton strains were noticeably infected by

A. macrospora, identified by J. C. F. Hopkins. The infection did not develop to any extent on the Gatooma Research Station; similar infections occurred on a few local farms.

In the Anglo-Egyptian Sudan work at the Gezira Station proved that all the X 1730 and N.T. 2 cotton strains, including those with added resistance to blackarm [*Xanthomonas malvacearum*], are very highly resistant to leaf curl under Gezira conditions; the N.T. 2 series is also equally resistant at Shambat. At the latter Station the work of transferring blackarm resistance [ibid., xxvi, p. 200] to Domains Sakel cottons, on the 'Egyptian' side, continues at the rate of two back-crosses a year. Over 7,000 acres of blackarm-resistant N.T. 2 were grown commercially, whilst resistant X 1730 reached the 45-acre stage for seventh back-cross material with a 15-acre nucleus of ninth back-cross origin; and a first wave of X 1370 carrying both B_2 and B_3 was synthesized. The report from Kadugli Station states that blackarm in that district appeared in late September, too late to do much damage, and that the introduction of the gene B_2 significantly increased yields where blackarm was present. On pp. 63–64 is a key to the symbols designating the cotton varieties used in the breeding work for blackarm resistance, with notes on their derivation and genetic constitution.

Experiments in the Gezira showed that of the 330 types of durra (*Sorghum* spp.) so far tested a number are immune from or resistant to *Sphacelotheca sorghi* form 3.

In the Kawanda area of Uganda it was found that in blackarm resistance tests the amount of infection obtained by spraying cotton plants with suspensions of *X. malvacearum* in the local water was very unsatisfactory; in 1945 the suspension was made up with rain water with entirely satisfactory results. In a variety trial for wilt (*Verticillium* sp.) resistance the cotton hybrid between K.P. 28 ex B. 181 (resistant) and K.P. 40 ex B.P. 50 (susceptible) was tested against its two parents by inoculation with a culture of the fungus; the percentages of the hybrid plants developing wilt symptoms (using a square root transformation) were close to the geometric means of the figures for the parents.

In Tanganyika the true position of blackarm is not yet fully appreciated; the disease seemed to be doing damage to district cotton on the poorer soils around Ukiriguru; at Lubaga there was a fair amount of bacterial boll rot on one part of the Station, while blackarm and angular leaf spot were rare. It is considered, however, that it would be advisable to add blackarm resistance to any cotton strain introduced into the territory. *Alternaria* was troublesome in patches at Lubaga.

In Nigeria the principal diseases of cotton are leaf curl, to which Ishan A is moderately resistant, blackarm, and anthracnose (*A. macrospora*).

Steyaert (R. L.). **Le 'wilt' du Cotonnier dû à Fusarium vasinfectum Atk.** [Cotton wilt due to *Fusarium vasinfectum* Atk.]—*Not. phytopath. Inst. nat. Étud. agron. Congo belge* 2, 15 pp., 5 pl., 2 maps, 1945. [Received March, 1947.]

After describing the geographical distribution, symptoms, morphology, pathological biology, manner of propagation, and control of cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, xxvi, p. 54], the author states that the disease was first definitely recognized in the Belgian Congo in 1937, when it was found at Bambesa [ibid., xviii, p. 797]. By 1945 the infection centres were concentrated in the eastern parts of Uele [ibid., xxv, p. 28]. In December, 1940, legislation was passed by the Province of Stanleyville to limit spread. All export of cotton seed from the Province is forbidden. Within the Province transport of seed in certain directions is also prohibited, while passage from certain areas to others is allowed only under stringent conditions. For control purposes the author recommends that in areas that have become affected only recently the diseased fields should be isolated at once, the crop destroyed, and the area concerned placed under forest fallow. In

badly affected districts only resistant varieties should be planted, the export of seed strictly supervised, and only healthy plants used as seed-bearers. Only the heavy seeds obtained after floating in water and delinting in sulphuric acid should be exported.

Bakker (J.). **Sterfte in den jongen Rozenaanplant, voorjaar 1946.** [Mortality in young Rose plantings in the spring of 1946.]—*Meded. Direct. Tuinb., 1946*, August, pp. 540–542, 1946.

Investigations are proceeding to determine the underlying factors in the heavy mortality among roses, affecting both young grafted bushes and cuttings at Aalsmeer and other places in Holland in the spring of 1946. Within the former group the die-back [cf. *R.A.M.*, xxii, p. 24] assumed a particularly severe character on large-flowered varieties, such as Geheimrat Duisberg, Better Times, Red Rapture, Roselandia, and Katherina Pechthold, among which losses of 70 to 90 per cent. were not exceptional. The bushes appeared perfectly healthy on planting in November, but by December to January there was no sign of the normal activity in the root system, and at the onset of leafing early in April the white hair rootlets were still lacking, so that with a sunny spell and excessive evaporation most of the shoots shrivelled completely. The yellow leaves fell and the stems, bearing brown to nearly black spots, died back from the tips. In many plants the phloem and some of the vascular bundles were also discoloured. Apparently healthy shoots continued to drop off until mid-May.

None of the physiological or cultural factors investigated bore any definite relation to the pathological condition of the plantings. *Peronospora sparsa* developed on some of the bushes in inadequately ventilated frames following copious watering to correct the desiccation. *Coniothyrium* [*fuckelii*] was undoubtedly concerned in the trouble among the cuttings, but its development is believed to have been secondary to insufficient hygienic precautions and faulty grafting practices.

Roekens (F.). **Bladvlekkenziekte der Dahlia (Entyloma dahliae Syd. en Phyllosticta dahliaecola Brun.).** [Dahlia leaf spot disease (*Entyloma dahliae* Syd. and *Phyllosticta dahliaecola* Brun.).]—*Cult. en Handel*, xii, 7, p. 27, 1946.

Attention is drawn to a recent outbreak on dahlia leaves in Belgium of smut (*Entyloma dahliae*) [*R.A.M.*, v, p. 429]. Another leaf spot is caused by *Phyllosticta dahliaecola*, which produces pale or whitish lesions bearing black pycnidia and later turning brown. When the young leaves are attacked the healthy parts continue to develop while the diseased areas remain stationary and subsequently fall out. The pathogens may be combated by prophylactic spring and summer sprays with Bordeaux mixture or other standard fungicides and the collection and destruction of the severely infected leaves. In the autumn, when the tubers are brought in, the infected foliage, etc., should be destroyed and as much of the stem as possible removed. The planting site should be changed wherever practicable and exposed to air and light, while wide spacing is also important. The soil should be deeply dug and limed and a potash fertilizer applied.

Timmermans (A[driana] S.). **Botrytis gladiolorum nov. spec., de veroorzaker van het Botrytis-rot der Gladiolen.** [*Botrytis gladiolorum* n. sp., the agent of the *Botrytis* rot of *Gladioli*.]—*Ned. kruidk. Arch.*, lii, pp. 59–64, 3 figs., 1942. [Received March, 1947.]

This is an abridged version of the author's study on the rot of *Gladiolus* corms in Holland caused by *Botrytis gladiolorum*, a fuller account of which has already appeared [*R.A.M.*, xxv, p. 501].

Mulder (A.). **De Helleboruscultuur en haar moelijkheden in Aalsmeer.** [Hellebore cultivation and its difficulties at Aalsmeer.]—*Tuinbouw, 1946*, 2, pp. 11–16, 1 fig., 1946.

Christmas rose (*Helleborus niger*), well known for its medicinal properties, is cultivated at Aalsmeer, Holland, chiefly as an ornamental. Of the 17 fungal pathogens recorded on the plant, *Coniothyrium hellebori* [*R.A.M.*, vii, pp. 12, 326] is the most troublesome locally, appearing on the young foliage in the spring after a spell of cold weather with easterly winds. The spots formed on the leaves are dark brown, irregular, sharply delimited, confluent, and sometimes concentrically zonate. A diseased plant constitutes a radius of infection, which spreads through an entire planting in two to four days, so that prompt destruction as soon as the symptoms develop is the principal, and at the moment the only known, means of control.

Guiscafré-Arrillaga (J.), Vélez (I.), Otero (J. I.), & González-Más (A.). **Botany and horticulture.**—*Rep. Inst. trop. Agric., P. R., 1945–46*, pp. 28–33, 1 fig., 1946.

During observations in Puerto Rico on the susceptibility of the Gramineae to fungi *Uromyces ignobilis* was found on the seeds of *Stenotaphrum secundatum* and other grasses. Grasses most susceptible to *Claviceps paspali* [*R.A.M.*, xxiv, p. 233] were *Paspalum millegrana*, *P. dilatatum*, *P. humboldtianum*, and *P. plicatulum*.

West (E.). **Sclerotium rolfsii Sacc. and its perfect stage on Climbing Fig.**—*Phytopathology*, xxxvii, 1, pp. 67–69, 1 fig., 1947.

In July, 1945, *Sclerotium rolfsii* was detected on several roughly semi-circular areas with a radius of 6 to 18 in. on dead climbing fig (*Ficus pumila*) leaves on the north wall of a greenhouse at the Florida Agricultural Experiment Station. The white to pale mycelium, which was particularly conspicuous on the tender, green stems and lower sides of leaves, united some of the adjacent leaves and radiated fan-like over newly affected patches. Small, subspherical sclerotia were formed on the dead stems and along the margins of the diseased leaves. The dead foliage was mostly reddish-brown, but the latest affected leaves were brownish-olive. Young stems and leaves were killed immediately, while older defoliated stems survived and subsequently produced new sprouts. Cultures on potato dextrose agar inoculated either with sclerotia or fragments of the advancing mycelial margin were typical of *S. rolfsii* and produced numerous tan sclerotia about 1 mm. in diameter.

A basidial stage of the fungus was discovered on the shaded lower sides of the leaves in the middle or inner layers of plants during sunny spells of two to three days following four- to six-day rainy periods. A few patches of this phase were again observed in June and July, 1946. The areolate, putty-coloured hymenium is 30 to 40 μ in thickness and the obovoid basidia measure 7 to 9 by 4 to 5 μ, each bearing two or four parallel or divergent sterigmata, 2·5 to 4 or occasionally up to 6 μ in length. The elliptical to obovate, hyaline, smooth spores are rounded above, rounded or apiculate at the base, and measure 6 to 7 by 3·5 to 5 μ. These dimensions fall within the limits given by Goto for *Corticium centrifugum* [*R.A.M.*, x, p. 345], but other characters, such as hymenial colour and density, are quite different. The basidia, sterigmata, and spores of the fig pathogen agree very well with those reported by Curzi for *C. rolfsii* [ibid., xi, p. 748], and since the other characters of that species were described from cultural material, discrepancies between them and the naturally produced fructifications on *F. pumila* may be disregarded. For the present, therefore, the basidial stage on fig leaves is regarded as identical with *C. rolfsii* (Sacc.) Curzi, but since *C.* spp. with an areolate hymenium, short-celled, stout hyphae, right-angled mycelial branching, and stout basidia have

been segregated in the genus *Pellicularia* [ibid., xxii, p. 372], the combination *P. rolfsii* (Sacc.) n. comb. is proposed as the correct name.

Of 15 single-basidiospore cultures, some mycelia were typical of *S. rolfsii* and resembled *S. delphinii* [ibid., xi, pp. 747–749] or were intermediate. All the isolates were parasitic on lupin (*Lupinus augustifolius*).

Fosteris (S.). **Un nouveau champignon imparfait : Cladosporium moldavicum nov. sp.** [A new imperfect fungus: *Cladosporium moldavicum* n. sp.]—*Bull. Sect. Sci. Acad. roum.*, xxvi, 7, pp. 492–495, 2 figs., 1944. [Received February, 1947.]

Cladosporium moldavicum n. sp., parasitic on all the aerial organs of *Festuca ovina* and *Avenastrum planiculme* in Rumania, is characterized by straight, simple, continuous or uni-, rarely biseptate conidiophores, dark brown at the base, becoming paler towards the apex, 75 to 200 by 3 to 5, mostly 130 by 4 μ, and acrogenous, oval or elongated, finely punctuate, yellow-brown conidia, continuous (4 to 14 by 4 to 5 μ), uniseptate (6 to 14 by 4 to 6 μ), rarely biseptate (4 to 18 by 5 to 7 μ), or very occasionally triseptate (18 to 23 by 5 to 8 μ).

Fruit bud development illustrated by a series of charts.—*Bull. Minist. Agric., Lond.*, 137, 7 col. pl., 1946. 2*s.* net.

This bulletin, prepared with the assistance of the Fruit Research Stations, the Association of British Insecticide Manufacturers, M. H. Moore, G. L. Hey, E. Holmes, and Dorothy Fitchew, contains 43 coloured illustrations depicting the bud development stages that are important when spraying or dusting apple, pear, plum, cherry, black currant, gooseberry, and raspberry. A standard name is applied to each stage, but spraying instructions have been purposely omitted, the bulletin thus consisting solely of botanical illustrations applicable for all seasons and all districts.

Roland (G.). **La septoriose du Poirier.** [Pear-tree septoriosis.]—*Fruit belge*, xiv, 65, pp. 32–36, 1946 [on p. 1 given as xiii, 64, pp. 32–36, 1945].

The author gives a succinct account of the symptoms of pear leaf fleck (*Mycosphaerella sentina*) [*R.A.M.*, xxvi, p. 64], the life-cycle of the fungus, varietal susceptibility, and control, based on the literature. The disease is not very important, as a rule, in Belgium, but causes a good deal of damage in years when a hot, early spring is experienced.

Delhaye (R.). **Note sur la moissisure rose de Poires sur l'arbre.** [Note on pink mould of Pears on the tree.]—*Fruit belge*, xii, 58, pp. 55, 56, 1944; 59–60, 1 pl., 1945. [Received April, 1947.]

It was noticed after the wet summer of 1943 at La Hulpe and Hoeilaart, Belgium, that pears bore patches of the pink mould fungus [*Trichothecium roseum*: cf. *R.A.M.*, x, p. 320] while still on the tree, in some cases when they were quite ripe and in others when they were still green. The mould followed a fairly severe attack of scab [*Venturia pirina*].

Kienholz (J. R.). **Pinto leaf, a transmissible disease of cherry.**—*Phytopathology*, xxxvii, 1, pp. 64–66, 1 fig., 1947.

An unusual type of foliar chlorosis on two Napoleon (Royal Ann) cherry trees first observed at The Dalles, Oregon, in June, 1943, is termed 'pinto leaf' on account of the resemblance of the blotchy pattern to that of certain western horses know as 'pinto ponies'. Subsequent surveys in the same district disclosed the

presence of the disease on other Napoleon trees, as well as on the Black Republican and Stark Gold varieties and mazzard seedlings, two of the last-named also having been found at Hood River, Oregon. The disorder is of minor importance at present owing to its restricted distribution.

The original pale green to yellow of the chlorotic patches of variable size gradually changes to bright yellow or white. Any part of the leaf may be involved, but a specific pattern is rarely formed. On mazzards, in particular, the chlorosis often appears as a coarse, indefinite stippling. The foliage of terminal shoots is seldom affected, but when it is a few of the basal leaves may show 'pinto' symptoms late in the season. Severely diseased trees are slightly stunted, produce less new growth, and the foliage presents a slightly ruffled aspect from a distance. Affected Napoleon and Stark Gold fruits failed to mature properly, the former remaining yellowish-green and the latter undersized, while the flavour of both was inferior.

Buds from 'pinto' trees were inserted into 13 symptomless sweet cherry seedlings towards the end of June, 1943, and during the following spring the typical features of the disease developed in three. In August, 1944, a series of buds from symptomless terminal shoots of diseased trees was inserted into 20 healthy mazzards, while a second group of 24 seedling trees was budded with infected heel spurs that had produced visible foliar symptoms. By the early spring of 1945 only one of the former and five of the latter group had contracted the disease.

The symptoms of 'pinto' resemble those of the apple mosaic virus [*R.A.M.*, xii, p. 636] the grape [vine] mosaic virus [ibid., xxv, p. 201], peach calico [ibid., xxiv, p. 65], and a 'white spot' disease of cherry [ibid., xix, p. 416; xxiv, p. 324] except for the characteristic 'oak leaf' design of the last-named, but are distinct from cherry line pattern [peach line-pattern virosis virus: ibid., xxv, p. 218]. Buds from a white-spotted Black Republican tree failed to transmit the symptoms when worked on to mazzard seedlings. Negative results were given by experiments in the transmission of 'pinto' to a number of stone and pome fruits. The Latin binomial *Marmor pintofolium* is proposed for the causal virus.

Zeller (S. M.) & Milbrath (J. A.). **Mild rusty mottle of Sweet Cherry (Prunus avium).**—*Phytopathology*, xxxvii, 2, pp. 77–84, 1 fig., 1947.

Mild rusty mottle, observed in Oregon and parts of Idaho and Washington on Bing, Black Republican, Black Tartarian, Lambert, and Napoleon sweet cherries and isolated from the sour Montmorency during the last six or seven years, appears to be distinct from the severe form of the same virus described by Reeves from Washington [*R.A.M.*, xx, p. 25]. Affected sweet cherry trees survive for a number of years, but seem to be more liable to winter injury and drought than healthy ones. The leaves show a rusty, bronzed mottle unaccompanied, however, by the necrosis commonly associated with the acute form of the disease. The mottling originates in May or early June as yellowish or pale green areas of variable shape. If circular, the centres are paler yellow than the margins, which gradually turn bronze or reddish, first on the upper and later on the under side. On other leaves the bronzing or rustiness may take the form of minute stipples, starting on or near the veins, usually at the base of the lamina, before extending to the mesophyll. If the rustiness follows a line pattern or rings, one side at least generally presents a feathered-out appearance. Leaves emerging early or shaded towards the middle of the tree may display a bright yellow or whitish mottle and be rapidly shed, and in exceptional cases a fairly heavy loss of mottled foliage may occur even before harvest-time. Delayed ripening of the fruit is a feature of rusty mottle, and the colour of Napoleon verges on clear yellow instead of the normal red.

The leaves of Montmorency sour cherries affected by the mild rusty-mottle virus showed a faint mottling and were abnormally small. On the under side a reddish necrosis originates along the veinlets and gradually spreads over the whole surface,

which presents a rusty coloration. By this time necrosis has developed in the older chlorotic spots on the upper side.

The disease was readily transmitted by graft inoculations to sweet and sour cherry, peach, flowering cherry (*Prunus serrulata*), and Italian prune. The mild rusty-mottle symptoms were about equally prominent in all the seven sweet cherry varieties tested, except for an occasional golden, marbled mottle with little bronzing or rustiness on Black Republican foliage. Slight necrosis may develop towards the end of the summer, but the acute form associated with severe rusty mottle or the type reported by Rhoads from Utah [ibid., xxiv, p. 324] was not observed. All the peach varieties and the Italian prune used in the trials were symptomless, as also was the Montmorency sour cherry for the greater part of the season, after the bronzed leaves were shed.

The following are important differences between mild and severe rusty mottle. The former does not cause nearly so rapid a decline of old sweet cherry trees as the latter, nor does it reduce the size or impair the quality of the fruit. The roughened bark mentioned by Rhoads as typical of the Utah form of the disease has never been noted in trees infected by mild rusty mottle, but a superficial splitting of the bark developed on one-year-old wood of three Bing cherries inoculated with severe rusty mottle from Washington. Defoliation in trees affected by the mild strain is not sufficiently extensive to give them the bare appearance of those attacked by severe rusty mottle. Acute necrosis of the chlorotic areas usually develops by the late spring or early summer in sweet cherry foliage infected by severe rusty mottle, but seldom or never occurs in the mild form of the disease. Again, in the severe type after 1st June rusty mottle shows on the leaves almost to the branch tips, while the symptoms of the mild virus only become apparent some distance back from this point. Peaches, *P. virginiana*, and some *P. serrulata* varieties react negatively to inoculation with the mild strain, whereas the severe one induces in those hosts a similar rustiness and bronzing to that observed in sweet cherries.

In peaches, Tilton apricots, and *P. serrulata* the severe rusty-mottle symptoms originate as a chlorotic mottling distributed over the leaves in circular areas with diffuse margins, somewhat resembling those of asteroid spot [ibid., xvii, p. 609], which is gradually superseded by a yellow to rusty-orange coloration with greenish islands.

Control of mild rusty mottle may be effected by the use of clean scion wood in nurseries and the roguing-out of affected trees in the orchard.

Blodgett (E. C.). **Rusty spot of Peach.**—*Phytopathology*, xxxvii, 2, pp. 145–147, 1 fig., 1947.

Rusty spot of peach, originally described by the writer from Idaho in 1941 [*R.A.M.*, xx, p. 311], has since been reported (*in litt.*) by E. L. Reeves from Washington, G. Stout from California, and H. R. McLarty from British Columbia, occasionally assuming a severe form in the two first-named.

In September, 1940, seven peach seedlings at the Idaho Agricultural Experiment Station were inoculated with three buds each of material from the orchard where the disease was first reported. No symptoms developed until August, 1945, when most of the fruits on six of the trees showed more or less severe rusty spot. One of these trees was known with certainty to represent the original under stock, the others being possibly developments of the scion. In the former the factor responsible for rusty spot was evidently either transmitted or provided contamination from the scion buds. Of a number of adjacent trees and others in the plots, including controls and some inoculated with various budwood collections, only one peach seedling contiguous to the infected trees bore a single rusty-spot and several healthy fruits; it had been inoculated in 1940 with buds of red-leaf chokecherry [*Prunus virginiana*].

Whether the rusty-spot factor is transmissible (as a virus), perpetuated (as a genetic abnormality), or carried mechanically (as an organism), the use of budwood from diseased trees for propagation should be discouraged. The occurrence of the trouble on one tree not inoculated with rusty-spot material indicates the possibility of orchard spread.

LEACH (R.). **Banana leaf spot (Mycosphaerella musicola) on the Gros Michel variety in Jamaica. Investigations on the aetiology of the disease and the principles of control by spraying.**—118 pp., 19 pl., 2 figs., 1 diag., 4 graphs, Government Printer, Kingston, 1946. 2*s*.

A brief summary of previous work on banana leaf spot (*Mycosphaerella musicola*) is given, with special reference to the initiation of spraying for its control on the Gros Michel variety. This practice was already established in Jamaica in 1940, when the author began his studies on the etiology of the disease to determine the principles on which a reduction in the number of spraying cycles could be safely based [*R.A.M.*, xx, p. 265; xxi, p. 381].

The perithecia, sporodochia, and spermogonia of *M. musicola* may develop in very variable proportions. Perithecial production is normally seasonal, occurring for the most part between August and December, during which period the numbers of sporodochia also tend to increase. The distribution of spots on a leaf differs with the type of spore giving rise to infection, the conidia producing typical 'line-spotting', primarily on the heart leaves, while the ascospores cause 'tip-spotting', mostly on the under sides of the youngest open leaves. Symptoms of the rare secondary infections caused by both spore types are also described.

The viability of the conidia is determined by the degree of maturity attained during their development. The seasonal decline in the activity of these organs in the colder months is correlated with their retarded development during the cooler nights, especially in January and February. Germination is inhibited by the biological antagonism of epiphytic mycelia and a gummy residue from the dew on the surfaces of the older leaves. Infection by means of the germ-tubes is regulated by their hydrotropic response towards open stomata. The stomata on the upper side open later in the morning and close earlier in the evening than those on the lower surface, on which infection through these apertures is much more consistent than on the upper.

Latency in spot development is closely correlated with the intensity of infection per unit area of foliar surface. Heavy spore infection results in the early appearance of the individual spots, the resistance of the host cells evidently collapsing under the influence of a toxin secreted in increasing profusion with the development of the intercellular hyphae.

It has been shown by experiments that nearly all infection by *M. musicola* in Jamaica is primary. Conidial infection is amenable to control by the regular three- to four-weekly spraying cycles, which are not, however, effective against the ascospores. The basic principle of leaf-spot prevention, therefore, is the attainment of a high standard of control of conidial infection during the spring and summer before the opening of the normal season of ascospore activity. Spraying controls conidial infection by the suppression of sporodochical sporulation and rendering the dew toxic to any conidia disseminated therein. Neither of these factors influences ascospore infection.

Certain soil conditions affect the metabolism of banana foliage in such a way as to stimulate the continuous production by *M. musicola* of an abnormally large number of perithecia, ascospore infection falling to a minimum only in the colder months [ibid., xxii, p. 172]. The standard spraying schedule being ineffectual against infection from this source, tip-spotting is likely to be very troublesome on such soils during the winter unless the control campaign is considerably intensified.

According to R. F. Innes, Agricultural Chemist, Department of Agriculture, out-of-season tip-spotting is associated with poor soil aeration, marked fluctuations in the oxidation-reduction relations, and shallow tilth layers, which may be counteracted by soil conservation measures, drainage, and any field practices contributing to the improvement of soil crumb and structure stabilities and the deepening and aeration of the surface tilth layer.

The importance of trash disposal is emphasized, especially in localities where spring and summer ascospore infection is prevalent. The operation should be carried out in the dry early spring (March) in preference to August, as ordinarily recommended. Fertilizers have not only failed to confer resistance to leaf spot but even adversely affected the control of conidial infection.

The vegetative growth of the plants is not appreciably impaired by leaf spot, but fruit production may suffer considerably, bunch formation being delayed and the size of finger (quality of individual fruits) and number of hands (grade) reduced in the order given. When the disease is brought under control the quality of the fruits is improved before the grade. Plants above a certain height (dependent on the severity and duration of infection in a given plantation) should be cut back before the commencement of spraying. In a badly diseased field time and material are wasted on any plants more than two-thirds the height of those with 'shot' bunches, since their fruit would probably be valueless however thorough the treatment. Such useless taller plants, moreover, serve as an additional source of infection to the shorter ones around them.

Symptoms of line- or tip-spotting on an individual leaf afford reliable evidence of the extent of infection at the time of unfolding, and may be used, having regard to the correlation between latency and intensity of infection, for the determination of the dates of seasonal fluctuations of the disease. These are discussed in relation to the four main climatic regions into which the banana districts can be divided, namely, western, central, northern, and eastern, with special reference to the periods at which spraying may be omitted with the maximum degree of safety. A considerable acreage of bananas in the western region, where the rainfall is practically continuous from April to November, falls within the radius of summer ascospore infection; tip-spotting assumes an acute form as early as July and may reach destructive proportions by January unless the regular summer spraying schedule is amplified considerably beyond twelve monthly cycles per annum. On the other hand, in the Lower Montego River Valley, where summer ascospore infection is absent, it may be feasible to curtail the treatments between the beginning of December and the end of April once a high standard of control has been secured by the routine summer programme. A similar course should also be practicable at the higher elevations of the central region, but on the irrigated coastal plains, where conidial production is abundant and atmospheric conditions conducive to infection, intensive spraying from June to September is necessary to prevent winter tip-spotting. The soils of the northern region tend to promote out-of-season ascospore infection, so that effective control can only be maintained by strict attention to summer spraying; tip-spotting may persist into March unless elimination has been largely accomplished before October. The enhanced viability of the conidia in this region precludes the discontinuance of spraying for more than two months in the year (January and February). In the eastern region, where only small areas are involved in summer ascospore infection, leaf spot can generally be combated by spring and summer treatments, and spraying may be omitted from December to March.

Orton (E. C.). **Dipping trials in drying fruit.**—*Aust. Dried Fruits News*, xxi, 11, p. 5, 1946.

Reasonably good control of [unspecified] moulds on sultanas drying on racks

was secured at the Commonwealth Research Station, Merbein, Victoria, by spraying with a cold dip of 3 to 4 per cent. caustic potash plus 1 per cent. shirlan, but sulphuring was more effective. Special hessian crepe side curtains, 50 yds. by 9 ft., were used and the sulphur was burnt in shallow pans (2 to 3 lb. per container) under each bay or every other one. Promising results were given in laboratory trials with calcium propionate, an effective preventive of moulds in flour [*R.A.M.*, xxi, p. 342].

Jensen (H. L.). **Observations on properties of certain fungicidal compounds.**—*Proc. Linn. Soc. N.S.W.*, lxxi, 3–4, pp. 119–129, 1 pl., 1946.

A number of fungicides were tested for their efficiency in the control of mould growth in the tropics on various industrial organic products used for military equipment [cf. *R.A.M.*, xxvi, p. 71]. The 23 organisms concerned in the spoilage were broadly divisible into two groups according to their action, viz. (A) *Stachybotrys* sp., isolated from a decayed sandbag, two strains of *Memnoniella echinata* [cf. above, p. 231], *Helminthosporium* sp., *Curvularia lunata*, *Pestalotia palmarum*, *Chaetomium funicola* [ibid., vi, p. 296], two sterile mycelia, and *Actinomyces* sp. from rotted tent canvas, and *Alternaria* sp. from flax straw; and (B) comprising *Aspergillus niger* from copper oleate-treated canvas, two strains of *A. flavus*, one from mouldy leather and the other from canvas treated with salicylanilide, four isolates of *Penicillium* from (*a*) a wireless set [ibid., xxiv, p. 379], (*b*) and (*c*) canvas treated with copper oleostearate, and (*d*) infected human blood serum with 0·01 per cent. merthiolate, *Paecilomyces* sp. from copper tannate-treated canvas, three strains of *Fusarium* from mouldy tent canvas, and *Pestalotia* sp. from mouldy leather.

The most active cellulose-destroyers in group (A) were *Stachybotrys* sp. and *M. echinata*, which caused a virtually complete loss of tensile strength of 12-oz. cotton duck on a mineral salts-agar medium after a week to a fortnight's incubation at 30° C. Next in order of virulence came *Actinomyces* sp., sterile mycelium (*b*), *C. funicola*, *Curvularia lunata*, and *P. palmarum*, which were responsible for 50 to 80 per cent. loss of strength in a fortnight, while *H.* sp., *Alternaria* sp., and sterile mycelium (*a*) were less active, causing only 10 to 30 per cent. reduction.

Of the fungicides tested, tri-, tetra-, and pentachlorophenol, paranitrophenol, and dinitro-ortho-cresol were most effective at an acid hydrogen-ion concentration (pH 4·7 to 4·8) where the compounds were present as non-ionized molecules, their toxicity and acidic strength increasing with the number of chlorine atoms or nitro groups. Salicylanilide was fairly efficient on the whole, though some of the more resistant fungi were not totally inhibited even at a concentration of 0·2 per cent. at an acid reaction, while in a few other cases moderate concentrations of 1 in 10 to 20,000 caused complete cessation of growth, which was resumed, however, at higher ones; isolate (*b*) of *Aspergillus flavus* gave evidence of ability to decompose this compound under certain conditions. Zephiran, an invert soap, gave very satisfactory results at a neutral reaction but was rather less active at pH 4·7 to 4·8. Phenylmercuric acetate was the most toxic of the compounds tested, especially at pH 4·7 to 4·8, where it was more ionized than at 7. It is tentatively assumed that the substituted phenols act on chemical groups in the cell interior and phenylmercuric acetate on sulphydryl groups at the surface. The fungistatic properties of copper sulphate were of a low order.

The results of supplementary experiments indicated that tetramethyl- and tetraethyl-thiuramdisulphide and tetrachlorobenzoquinone were similar to, or somewhat higher than, salicylanilide in fungistatic value. DDT (dichlorodiphenyltrichloroethane) proved useless for the object in view [cf. ibid., xxiv, pp. 198, 246, *et passim*].

Barail (L.). **Toxicity of germicides.**—*Amer. Dyest. Reptr*, xxxv, 22, pp. 521–524, 1946.

Of over 250 compounds tested for their germicidal and fungicidal efficiency in the treatment of fabrics, only 15 were found to be suitable for the purpose in view, and of these not more than seven were non-toxic to rabbits in intraperitoneal infections. Only six caused no irritation of the skin, and of these three could not be used on light materials, while one alone (lactoxy-phenylmercuric ammonium lactate) was both non-irritating and non-sensitizing even at a concentration as high as 1 per cent. It is concluded from these results that many manufacturers make exaggerated claims, not only for the efficacy of their products, but also for their low toxicity and absence of irritant properties. The great value of the patch-test method of Schwartz and Peck (applicable to human beings) in the elimination of injurious preparations is emphasized.

Horsey (R. E.). **Hundred mills specify mildewproofing wants.**—*Text. World*, xcvi, 8, p. 123, 1 fig., 1946.

The need during the war for a compound that would protect textiles from mildew in the tropics led to the development of dihydroxy-dichloro-diphenylmethane, commonly known as G–4. Valuable information as to the peace-time requirements of 99 United States mills was elicited from the replies to a questionnaire, the following properties being listed as essential in mildew-resistant finishes: freedom from odour and corrosive action, absence of toxicity, resistance to weather (heat, light, and water), durability, and flexibility. Of 63 organizations expressing preference for a particular type of finish, 36 (57 per cent.) were in favour of chlorinated phenol, 15 (24) of mercurials, and 12 (19) of metallic soaps.

Bayley (C. H.) & Weatherburn (Muriel W.). **The effect of weathering on various rotproofing treatments applied to Cotton tentage duck.**—*Canad. J. Res.*, Sect. F, xxv, 1, pp. 92–109, 1 pl., 1947.

Cotton tentage duck treated against rotting by microbiological agency [*R.A.M.*, xxv, p. 355] with ferric oxide-chromic oxide (mineral khaki) [ibid., xxv, p. 516], copper carbonate-ferric oxide (copper-iron), cuprammonium, cutch-cuprammonium, copper 8-quinolate, copper glyoxime, 2,2′-dihydroxy-5,5′ dichlorodiphenylmethane (G–4) [ibid., xxv, p. 515], zinc dimethyldithiocarbamate [zerlate], copper naphthenate, copper hydroxynaphthenate, zinc naphthenate, or mercuric naphthenate showed various degrees of loss in breaking strength when exposed to outdoor weathering in summer. The losses, however, were in no instance greater than with untreated fabric, and some treatments, e.g., mineral khaki and cutch-cuprammonium, gave marked protection against loss in breaking strength. With copper naphthenate, copper hydroxynaphthenate, and mercuric naphthenate the degree of chemical degradation, as measured by cuprammonium fluidity, was rather greater than in the untreated fabric. Waterproofing by a mixture of petroleum-base waxes in addition to the rot-proofing treatments generally increased the breaking-strength loss. The water resistance of the waxed samples showed slight to conspicuous increase after weathering. In general, there was marked loss of rot proofer as a result of weathering, the loss amounting to 37 to 90 per cent. with the copper compounds, though reduced to 6 to 44 per cent. by the presence of wax. Weathering caused almost complete loss of the two zinc compounds, G–4 and mercuric naphthenate. Losses of metal from chromium-iron proofings were negligible even in the absence of wax proofing. Degree of rot resistance, as estimated by soil burial, was greatest in the copper treatments, and was increased by wax. The water resistance of fabrics subjected to soil burial was often decreased before the occurrence of any marked loss in breaking strength, indicating microbiological attack on the wax coating before attack on the fabric.

SHEMA (B. F.). **Method for evaluating the fungicidal properties of treated paper and paperboard.**—*Paper Tr. J.*, Tech. Sect., cxxiii, 23, pp. 179–180, 1946.

The following simple method is proposed for the evaluation of the fungicidal properties of treated paper and paperboard, using *Chaetomium globosum* and *Aspergillus niger* as the test organisms. Two-in. squares of the samples are placed on the surface of a medium consisting of 1,000 ml. tap-water, 3 gm. sodium nitrate, 1 gm. dipotassium hydrogen phosphate, 0·25 gm. each of potassium chloride and magnesium sulphate, and 10 gm. agar, sterilized at 15 lb. pressure for 20 minutes at 120° C. and adjusted to pH 6·8 to 7. Suspensions of the test fungi from 14-day-old cultures in 8-oz. bottles containing 0·5- to 0·75-in. glass beads, a disk of filter paper cut in four sections, and 20 ml. of the nutrient salt medium, are distributed over the paper samples and the dishes incubated for two to three weeks at 26° to 30°, after which the efficacy of the various treatments may be determined by visual inspection.

At the Institute of Paper Chemistry, Appleton, Wisconsin, this procedure was applied to over 70 samples, including papers and board impregnated with disinfectants or coated with cellulose acetate and casein containing a fungicide. Experimental data showed *A. niger* to be the more resistant of the two organisms on samples treated with mercury compounds, but in all the other tests, notably those involving the use of chlorinated phenols, the results were essentially identical for both moulds.

ROSE (C. D.). **A new staining method to demonstrate the presence of mould in vegetable-tanned leather.**—*Rep. Brit. Leath. Mfrs Ass.*, xxv, 3, pp. 489–491, 1 fig., 1946.

Thin sections of leather are first soaked in a mixture of 70 per cent. acetone and 30 per cent. distilled water (changed at least once) to remove the tan. They are then transferred to a 50–50 acetone distilled water mixture, and then to the stain for 5 to 15 seconds. The stain consists of 0·9 gm. pyronin, 0·1 gm. methylene green, 9 c.c. alcohol (98 per cent.), 10 c.c. glycerol, plus phenol (0·5 per cent. aq.) to make up to 100 c.c. The stained sections are washed in 50 per cent. alcohol several times, dehydrated, and cleared in clove oil and xylol. The hyphae stain red against a pink background, the spores turning a much deeper colour.

This method has the advantage of being easier to standardize than the methylene blue method, the stain does not fade, the acetone solution causes much less distortion of fibre structure than the alkali method of stripping, and, finally, no bleaching is necessary.

VERONA (O.). **Di una singolare vegetazione microbica del sapone.** [On an unusual microbial growth on soap.]—Reprinted from *Ann. Fac. agr. Pisa*, N.S., vi, 7 pp., 3 figs., 1945. [Received March, 1947.]

From a mouldy bar of green household soap (18·7 per cent. moisture, 35·7 per cent. total fats, and strongly alkaline) purchased through the ordinary commercial channels and kept in the house, the author isolated an organism provisionally named *Micrococcus saponophilus* n. sp., *Penicillium crustosum* [*R.A.M.*, xviii, p. 712], *P. flavidorsum* (showing a continuous, not zonate, growth), and a species of *Cladosporium*. Experimental evidence indicated that the infection was favoured by the high moisture content of the soap, the alkali tolerance of the organisms, and their ability (though limited) to attack fats.

STEYAERT (R. L.). **Une technique rapide permettant le montage au baume du matériel botanique.** [A rapid technique for mounting botanical material in balsam.]—*Parasitica*, ii, 4, pp. 137–138, 1946.

The author describes the following method of permanently preserving microscopic preparations such as scrapings from leaves, bark, or fruits, or hand sections

Drops of chloralphenol (equal weights of chloral hydrate and phenol crystals), which is miscible with both water and balsam, are deposited near the cover slip while the aqueous medium in which the material was examined is withdrawn by pieces of filter paper. The slides are then gently heated to remove air bubbles. The treatment with chloralphenol is repeated until all the water has been removed. Drops of balsam dissolved in xylol are then deposited near the edge of the cover, and the chloralphenol is drawn out with filter paper, being replaced by balsam. The slides are then heated rather more strongly until the remaining chloralphenol has evaporated. More balsam should be added gradually as the xylol evaporates; if this is not done, air bubbles form under the cover slip. The preparation is thus finally mounted in pure balsam.

The only unsuitable materials for this technique are hyaline spores or mycelia which are almost invisible in the balsam. One further drawback arises when free spores are present, which may become displaced or disappear during the mixing of the two media. In such a case, the scrapings can be placed directly in a mixture of chloralphenol and Canada balsam dissolved in xylol. The chloralphenol clears the material and secures the penetration of the balsam. With cover slip in place the slides are warmed to evaporate the chloralphenol. This method can be used only for herbarium material or material previously dried.

Carlson (J. G.), Hollaender (A.), & Gaulden (Mary E.). **Ultraviolet radiation as a means of sterilizing tissue culture materials.**—*Science*, cv, 2720, pp. 187–188, 2 figs., 1947.

For sterilizing tissue-culture materials, including physiological salt solutions, by means of ultra-violet radiation of wave-length 2,537 Å [*R.A.M.*, xxiii, p. 140] the authors have devised a special apparatus. An aluminium-lined box containing an 8-watt, commercial, low-pressure, mercury vapour lamp is covered by a transparent shield to protect the eyes, consisting of a sheet of unexposed, processed X-ray film which absorbs practically all the 2,537 Å ultra-violet rays striking it. The aluminium cover of the box has openings for dissecting instruments, cover-glasses, and slides. The instruments are kept sterile by exposure to radiation when not in use. A few minutes before a set of preparations is to be made, cover-glasses and depression slides are inverted over the larger openings. Flasks stand on the bottom of the box and cellophane is placed under the corks to prevent mould growth and check entry of contaminants. Five minutes irradiation is considered sufficient for sterilization.

Jenkins (Anna E.). **A specific term for diseases caused by Elsinoë and Sphaceloma.**—*Plant Dis. Reptr*, xxxi, 2, p. 71, 1947. [Mimeographed.]

The author has decided to adopt the term 'spot anthracnoses' to designate collectively and specifically the diseases caused by *Elsinoë* and *Sphaceloma*. It was originally used, in the singular and in French ('anthracnose maculée'), by E. Fabre and F. Dunal in 1853 to denote the vine disease the pathogen of which was described by de Bary in 1874 as *S. ampelinum* [*E. ampelina*: cf. *R.A.M.*, xxi, p. 225].

Ramsbottom (J.). **Fungi and modern affairs.**—*Rep. Smithson. Instn, 1945*, pp. 313–326, 1946.

This paper, the substance of three lectures delivered at the Royal Institution in 1944, is a reprint, with additions, of that already noticed [*R.A.M.*, xxiii, p. 397].

Stevens (N. E.) & Stevens (R. B.). **Plant diseases during the years 1941–1945 in the United States and Canada.**—*Bot. Rev.*, xiii, 2, pp. 92–115, 2 graphs, 7 maps, 1947.

This is a summarized account, based largely on information that has appeared from time to time in the *Plant Disease Reporter*, on the incidence of and the losses

sustained in the United States and Canada from 1941 to 1945, inclusive, from some of the more important plant diseases [cf. *R.A.M.*, xxi, p. 213]. Much of the information presented has already been noticed in this *Review*.

OWEN (H.). **Mosaic diseases of Malvaceae in Trinidad, B.W.I.**—*Trop. Agriculture, Trin.*, xxiii, 9, pp. 157–162, 2 pl., 1 graph, 1946.

Investigations into mosaic diseases of *Hibiscus esculentus*, *Malachra alceifolia*, *Sida acuta*, *S. glomerata*, *S. linifolia*, *S. rhombifolia*, *S. urens*, and *Triumfetta lappula* (Tiliaceae) in Trinidad are described. Young leaves of *H. esculentus*, when affected, show interveinal angular blotches ranging from palish green to yellow tinted with green. On older, severely affected leaves the whole surface, except for the major veins, is bright yellow or whitish, the normal green extending outwards from the veins in a narrow, undulating band; slight blistering of the surface often occurs. Occasionally, mature or almost mature leaves present only a diffuse yellow-green mottle.

On *M. alceifolia* most young leaves show bright-yellow patches extending over and including the secondary and smaller veins, and sometimes of the primary ones. In some, the veins alone are cleared. More mature leaves may show (1) a bright-yellow or whitish vein-clearing only affecting all veins, the interveinal areas being normal green, (2) vein-clearing with some interveinal chlorosis, (3) least commonly, interveinal chlorosis alone. The three types of symptom intergrade; all three may occur on the same leaf, and do regularly occur on the same plant, but with one type of symptom usually predominating.

On *Sida* spp., apart from a very small amount of vein-clearing seen on a few young leaves of *S. urens*, interveinal chlorosis is general. Areas bounded by the midrib, primary veins, and the margin may be completely chlorotic, or may contain small green islands generally bounded by smaller veins. On other plants, the leaves are dotted with interveinal chlorotic areas. A primary vein between two adjacent chlorotic areas may or may not be chlorotic. It is unusual for the whole interveinal leaf surface to be chlorotic, but this condition may occur in a few older leaves which are generally whitish.

In *S. glomerata* it is more usual for all the affected leaves to become chlorotic over the whole leaf surface, or most of it. The margins of the young leaves may curl downwards, and in all [*Sida*] species there is a tendency for severely affected leaves to be malformed and show a rugose effect.

T. lappula shows two chief types of symptom: conspicuous vein-clearing and sharply defined interveinal chlorosis. Both are often present on the same leaf. Any one plant usually shows a preponderance of one symptom or the other. On the youngest leaves the symptoms consist of small, inconspicuous, pale blotches and veinal chlorosis. As the leaves develop, the markings extend and become brighter and more sharply defined. Veins up to the fourth order may be cleared or may delimit chlorotic areas. Some observational evidence indicates the presence of an insect vector or vectors.

The mosaic was transmitted by grafting from each species found naturally infected (except *S. linifolia*, with which experiments were not made) to healthy plants of the same species. No transmission by sap inoculation or by seed was observed and none occurred in any intergeneric or inter-family grafts. Transmission was effected in every combination between *S. acuta*, *S. rhombifolia*, and *S. urens*, the mosaics of which are accordingly attributed to a single virus. The tentative conclusion is drawn, from the general similarity of the symptoms presented by *Sida* spp. in Trinidad and Brazil [cf. *R.A.M.*, xxiii, p. 439], that the mosaic disease on these plants is the same in both localities, and judging from Silberschmidt's plates and descriptions [loc. cit.] it would appear that his 'infectious chlorosis' of *Abutilon* is due to *Abutilon* virus [*Abutilon* variegation virus] and that the *Sida* mosaic in Trinidad is due to the same virus.